THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CIX. No. 2435.] LONDON, JANUARY 11, 1910. [62ND YEAR. PRICE 6d.

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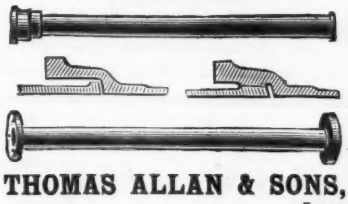

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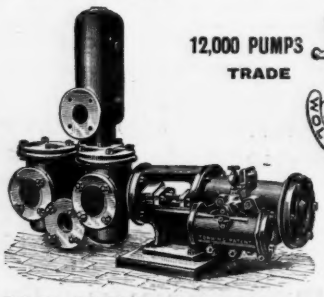

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

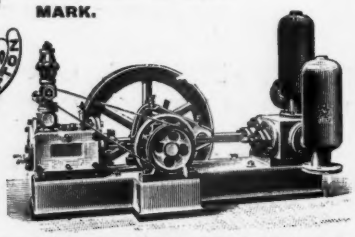

Fig. 683. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

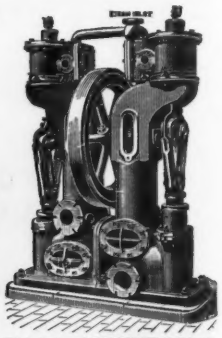

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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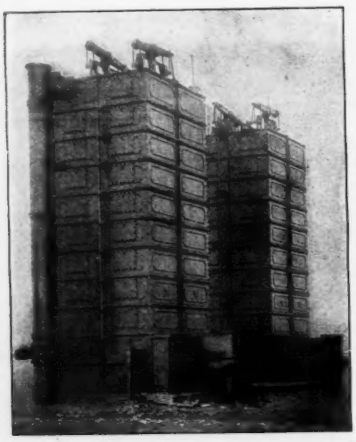

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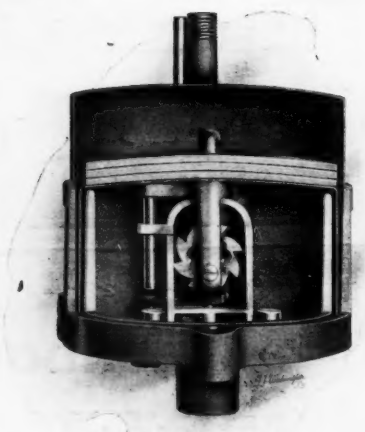

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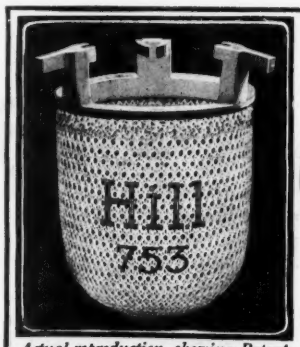

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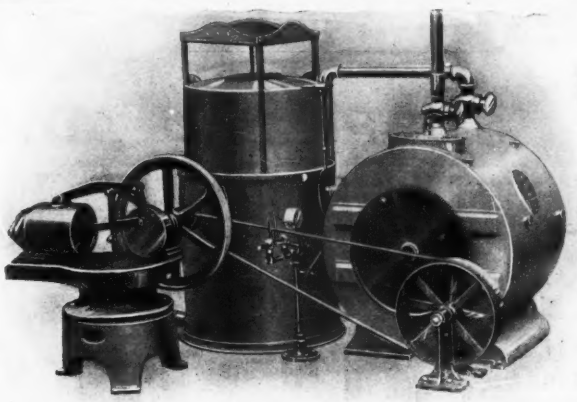

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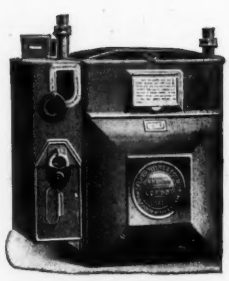

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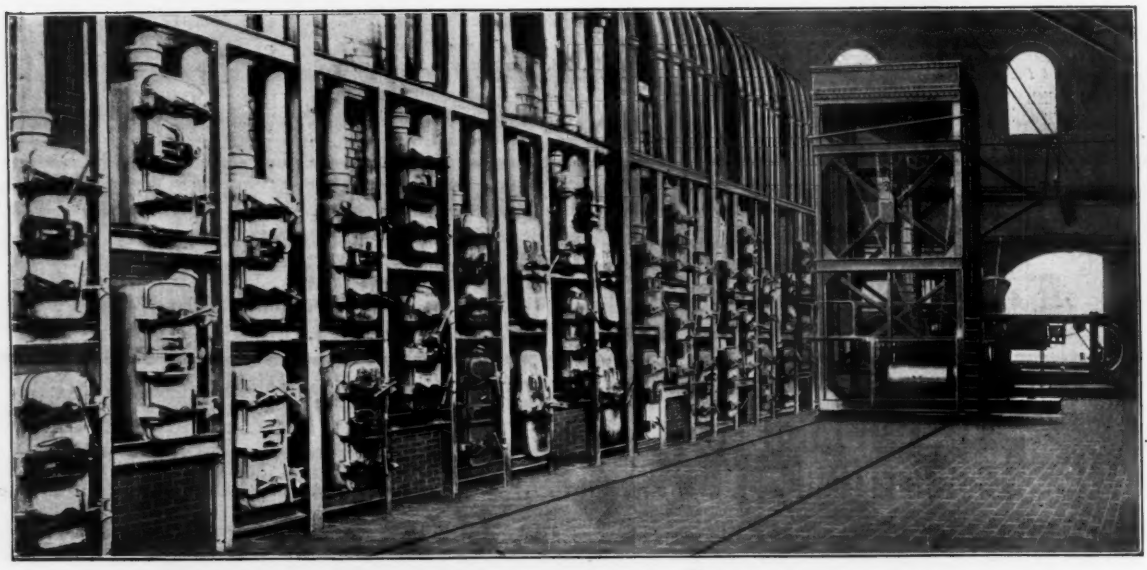

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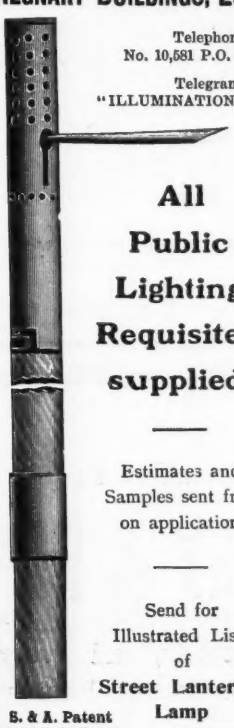

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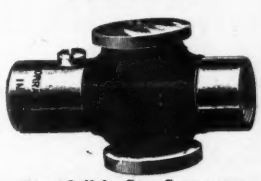

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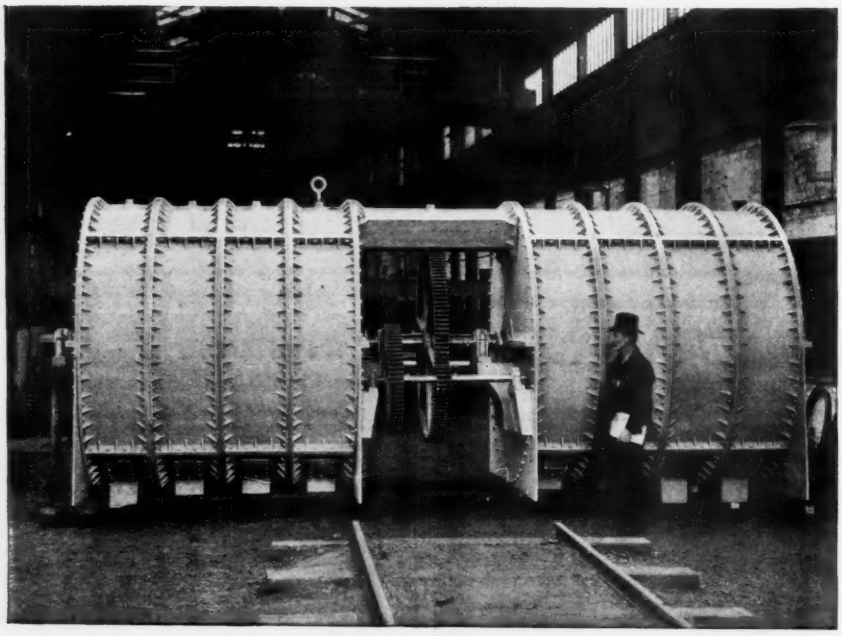

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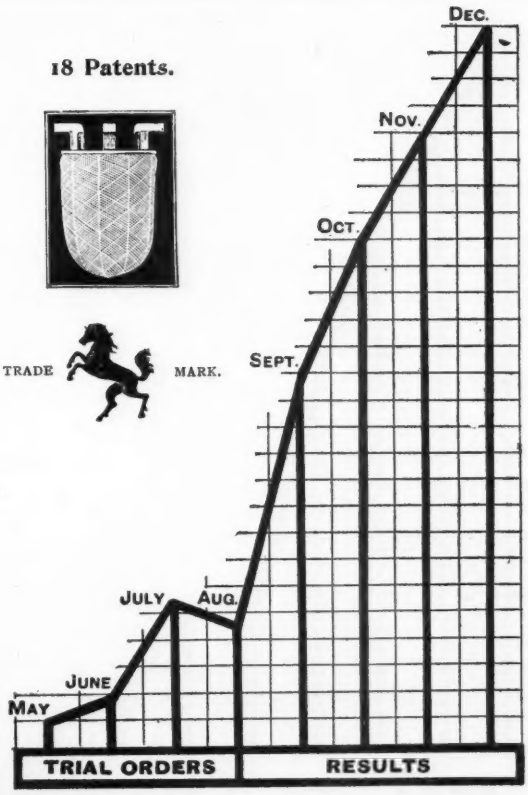

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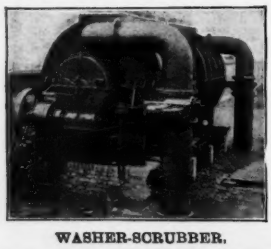
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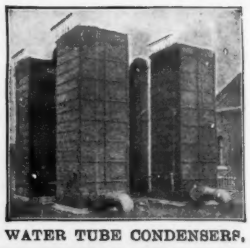
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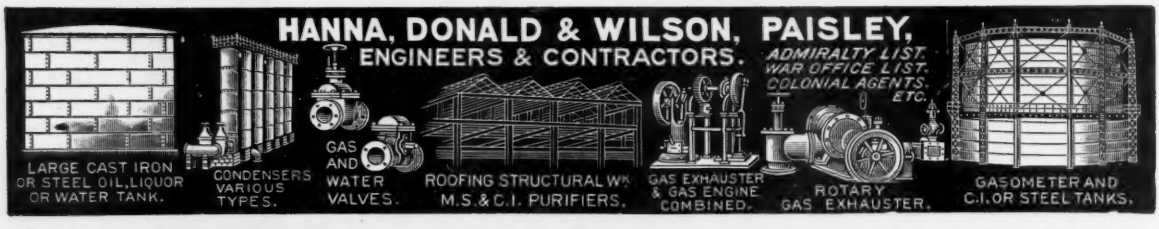
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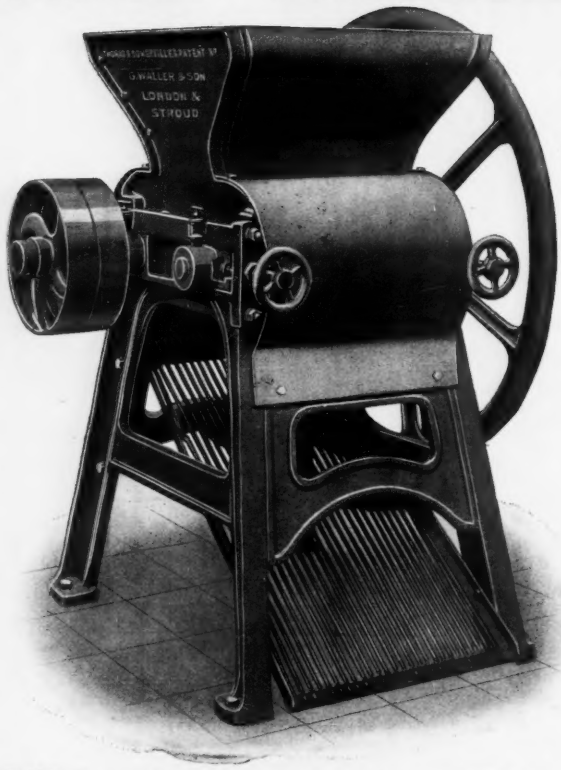

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EDITORIAL NOTES—GAS, &c.

Viewing the Vertical Retort Position.

WHEN Herr E. Körting, the General Manager of the Berlin works of the Imperial Continental Gas Association, speaks or writes on the subject of carbonization, he is assured of extensive attention. His communication to the "Journal für Gasbeleuchtung," of which a translation appears in this and last week's issue of the "JOURNAL," is fully up to the high standard of critical examination to which we have become accustomed when Herr Körting is the examiner. With him we fully agree that it is most difficult to keep oneself fully *au courant* with the ever-swelling mass of detail regarding carbonization that issues from the structural improvement and working of the newer rival systems and the operation of the older ones on latter-day lines; and without minute study, it is impossible to give the different claims their proper value. Fresh advantages or gains may have certain disadvantages or losses set against them; and, unless a comprehensive and critical survey is made, one may be misled by something that appears to be the absolute determining factor, and then ultimately receive a rude awakening to the truth that other factors combine to deprive of its gilt that which has persuaded on first blush into acceptance. The prudent course is to take nothing for granted without complete personal investigation. The more is this needed when, if it be true, the gas industry has grown so degenerate that it is possible for "a well-known "gas engineer to express his views in the drastic statement "that there have never before in the gas industry been so "many lies told as at the present time." Although Herr Körting does not wholly endorse this statement, he does so partially in the remark that "to a certain extent this ex-"pression of opinion may have some justification," and in the palliation that "it is in accordance with human nature "that, for the sake of business interest or personal advan-"tage, glowing statements should be made and failings sup-"pressed." It is regrettable that it should have been felt that, in connection with such a purely technical matter as carbonization, there was occasion for the introduction of this protest; but, having been introduced, it is hoped by us that it is directed to German quarters and not to British ones. We entirely fail to see where any lasting benefit is to come in from false representations in such a matter as carbonizing plant and its performances, as such representations are bound "to come home to roost," to the detriment and discomfiture of those who make them.

The progress of vertical retorts has experienced a no small amount of resistance from horizontal retorts worked under the heavier charge and the longer carbonization period. Herr Körting calls attention to the result claims in this connection of British engineers; and he discusses the theoretical causes of success, and the reason why in Germany, working in similar manner with horizontal retorts, the same result attainment cannot be realized, though using the same coal. The reason is simply this, that the greater proportion of coal used in England is gasified while fresh, and is not stored for a long period as in Germany. There is no doubt something in this, and particularly in those places—such as Berlin—where the whole of the winter coal requirements have to be placed in store during the summer. But leaving out this factor, all the conditions that contribute to the greater production per ton, by the use in horizontal retorts of heavier charges and the adoption of longer carbonization periods—conditions comprising the avoidance to a great extent of the decomposition of the gas, the working at higher temperatures, the better utilization of the heat, the better distribution of the heavier charges in the retorts, the less frequent opening of the mouthpiece lids—all apply equally in Germany as in this country. The coal from store, whether used in vertical or horizontal retorts, is the same. And having regard to the figures that have been published for Dessau vertical retort working, and to what Herr Körting now says as to his trial experiences with heavier charges in inclined retorts, it would seem there is nothing much, looking to gas production *per se*, to choose between intermittent vertical and horizontal working under the latest approved methods, using the same coal from stock, and without the introduction of steam into the retorts. But, of course, gas make is not the only consideration.

There are in the article a few structural and working criticisms of the continuous systems of carbonization. The structural ones may be left to those interested, with the necessary experience to (if that be possible) controvert the criticism. Among the disadvantages of the continuous system as seen by Herr Körting is that separate charging and discharging mechanism is required for each retort. In saying this, it is, of course, within the knowledge of Herr Körting that the point as to charging mechanism has not general application. The second criticism, as to the continuous movement of the contents of the retort not being advantageous to the coke, requires qualification. The descent is so gradual, the discharge so smooth and in such small quantities, that the amount of breeze formed, we should imagine, is no greater than is the case in the single evacuation of the heavy charge from an intermittently operated vertical retort. It is true, the coke of the intermittently charged vertical retort is denser than that from a continuously charged one, and consequently less friable; but, from observation, we should be inclined to believe that the proportion of breeze in the case of continuous vertical retorts is less than in horizontal working. As to the third criticism, regarding the impossibility of inspecting the inside of continuously operated vertical retorts, to ascertain whether they need repair, and whether the coal is properly disposed in them, this is not a matter to which actual experience gives much weight. Confessedly, there is a drawback here; but with the provision made, it is not of the magnitude that may be pictured when preferential feelings lie in some other direction. To but slightly alter Herr Körting's remark, *On préfère toujours son premier amour.*

Carbonizing chambers in which heavy weights of coal are used also come under Herr Körting's criticism. In his opinion, a big price is paid in connection with them for any small saving in labour costs in comparison with other modern methods of carbonization for gas production. At the low point to which carbonization wages have been brought to-day in well-conducted works, under moderate-charge carbonization, further economy is hardly worth consideration; but economy of fuel consumption is altogether a different matter. Wages at Berlin rates amount at the present time to about 0·3d. per 1000 cubic feet; whereas the fuel consumption in heating and settings entails a cost of about 3d. per 1000 cubic feet. Hence, Herr Körting points out, a reduction of 10 per cent. in the fuel consumption amounts to as much as the whole expenditure on wages. Experiments in increasing the girth of vertical retorts in Berlin in order to take heavier charges, have proved that there is no advantage, but distinctly otherwise; and the results have there led to the conclusion that the direction of progress is in increasing the heating surface relatively to the weight of the charge. To give effect to this idea, Herr Körting has put into settings of like dimensions eighteen vertical retorts where only twelve existed before. This has enabled 25 per cent. more coal to be charged into the retorts of a single setting, while the radiating surfaces of the latter remain unchanged; the increased output has been attained without making any change in the disposition of the producer and recuperator; there is an economy in the capital expenditure of 25 per cent., and in fuel consumption of 3 per cent.; as well as a saving of labour. These are among the advantages presented for the new arrangement of Dessau setting as developed at Berlin. Working trial results were published last week; and their import is accentuated in the instalment of Herr Körting's article published this week. Altogether the contribution to the question of carbonization is one that commands interest; and it indicates that vertical retort working is subject, as many other things, to improvement and progressively higher value in result.

Shop Lighting and the Public Safety.

THE inquiry into the cause of the lamentable fire at Clapham Junction just before Christmas has ended in a verdict from which there was no escape, and which all intelligent people expected, but which naturally is most distasteful to the electrical industry. The loss of human life and of property, of course, moves our sympathetic feelings; but this is not an occasion on which the appalling results call upon us to avoid attendant considerations. Rather do the appalling results urge the necessity of safeguarding the future by the practical lessons of the catastrophe. The practical lessons both the electrical industry and traders are bound to observe unless they desire to be charged with wilful and culpable negligence on a repetition of such a disaster, small or great, having similar origin. It really required something that was absolutely sensational (we regret the awful measure) to awaken electricians to a proper sense of their responsibility in this matter of electrical risks, and to stay the persistent misrepresentation as to the absolute safety of electricity, in which misrepresentation they have indulged freely for purely commercial purposes. A mass of demonstrating negation has accumulated; but of it all, the latest addition is the most dire, and let us hope at the same time it will prove the most salutary.

From the evidence given at the inquest, it is patent that there exists a large amount of ignorance among shopkeepers as to the danger of electric lighting. We have the manager of one trading establishment in the neighbourhood of the ruins and heaped-up *débris* of the great Clapham emporium stating that shopkeepers do not seem to consider the danger of electric lighting with reference to fire, and that shop windows all over London—not only at Christmas time when the display is profuse, but at others—are dressed with combustible materials with electric lamps in close proximity. The installation may be carried out in the most technically approved manner; but no one can guarantee (as this lugubrious illustration proves) that something will not occur, such as a lamp breaking, that will be the incipient of a terrible catastrophe. In the main installation at Messrs. Arding and Hobbs, Mr. Sidney G. Russell, the Chief Electrical Engineer of the Phœnix Fire Office, bears witness to everything conceivable having been done for protective purposes in fitting up this so-called safest of illuminating agents. The wires were all run in iron tubes, the apparatus was enclosed in cast-iron boxes, and no expense was spared to ensure security from fire. The shop window lighting was most carefully considered, and all possibilities were met by every safeguard. Nevertheless, eight human lives have been lost, and the noble pile of buildings is but a heap of ruins! The greatest precautions may be taken—those that are essential are many—but one unsuspected small thing may produce, as here, most deplorable destruction. The Fire Offices provide conditions that would appear to be ample in detail; and yet, according to two of the witnesses, Messrs. Arding and Hobbs had general permission from the Phœnix Office to increase, on occasion, the number of lights installed. Where such general permission now exists, it may be taken the Fire Offices will promptly see that it is removed. For there is danger in the freedom. In this case, although Mr. Russell did not inspect the extension installation, he believes it was properly carried out, excepting in the one particular that the Phœnix rules provide that flexible cord conductors not furnished with an efficient flame-proof covering must not be used in shop windows containing inflammable goods. This rule was not observed in this instance. But it seems abundantly clear that, fruitful as flexible wires have been in originating conflagrations, the wire was not at fault on this occasion. All the evidence pointed to the fire being—and the Jury found that it was—started by the bursting of one of the electric lamps.

Here, then, is a risk of which many shopkeepers are perfectly ignorant. The electrical contractor who supervised the additional Christmas installation at Messrs. Arding and Hobbs' was well acquainted before the disaster with the fire-raising potentialities of electric lamps; and he appears to have taken every precaution in keeping the extra lamps that were put in as far as possible from the goods with which the windows were to be stocked. But that was not sufficient as events proved. There are several ways in which lamps may be a danger without being in actual contact with, or contiguous to, the displayed goods. In this case, the lamps were of the Tantalum type; and they were run in series. A lamp may become broken, and produce a short-circuit to the leads in the lamp itself; and the result of this might be to put the whole pressure on the other lamp, probably blowing out its internal parts, or completely shattering the lamp. There is little or no doubt on the part of Mr. Russell as to the fire having really originated in the bursting of one of the electric lamp globes. One fairly frequent cause of such burstings is outward atmospheric pressure. Another cause is short-circuiting of the filament; or if a filament sags and touches a globe that will often produce a breakage. Mr. Russell described in his evidence some interesting experiments that he had made, which showed how easy it is to set fire to cotton wool with incandescent electric lamps. And it indicates how ignorant many shopkeepers are, or how prone to accept the electrical advocate's assertion that the electric light is incapable of fire-raising, when Mr. Russell, from his experience, states that the practice of placing electric lamps in proximity to inflammable goods in shop windows in London is so great that he has "frequently" recommended the Phœnix Office to throw up business rather than retain the risk. We should like to know whether or not information that has reached us is true, that since the advent of the metallic filament lamp fire insurance companies have had to deal with more claims for damage from broken lamps than they had to do in the days when the carbon filament lamp held undisputed sway as the electrical means of interior lighting.

The inquiry has made clear the facts (which should be widely known for the public protection) that in the window where the fire originated, and the same thing obtains in many other shops in which there are inflammable goods, there were two sources of fire risk—the lamps and the flexible wiring, and that it was one of the small lamps that burst, and produced the tragic havoc pictured in the daily press. We have also other clear points, that though the Fire Offices make such stringent regulations in regard to installation, fires of electrical origin still occur; also that, although there exist such stringent regulations, the Fire Offices grant general permission to make additions to the electric lighting of shops at Christmas and other times. In the public interest, this liberty ought not to be allowed, though any amount of inspection would not have prevented the bursting of the lamp that was, the Jury find on clear evidence, the cause of the disaster. One other revelation has been the vast amount of ignorance that exists among shopkeepers as to the risks they are running with electric lighting for display purposes. But the Coroner (Mr. John Troutbeck) has pointed out that, now that such prominence has been given to the peril, if anyone continues to use electric lamps in the manner in which they were employed in the shop window where the fire started, and a fire results, he will find himself in a serious position. Electricity undertakings ought to give this warning the greatest possible prominence; but will they do so? If they do not, and continue to advertise electricity as the safest illuminant, the short reply will be—"Remember Clapham!"

The Northern Coal Dispute.

THE trouble that has arisen in the coal-fields of Durham and Northumberland over the coming into operation of the Coal Mines (Eight Hours) Act, naturally causes those who are large purchasers of coal to reflect upon the various new phases that have developed. Owing to the events in connection with the coal industry during the past twelve months, confidence of buyers in any durability of conditions has been greatly shattered; and what has occurred in Durham and Northumberland will make the feeling still more unsettled. In these two counties, the coal owners and miners had six months longer than any other coal-producing part of the country to arrange matters for the bringing into operation of the Act; and at the same time they had the experiences of the remaining coal-fields from which to draw guidance, though in every field there were, of course, differences to settle. Authorities behind the scenes quietly warned us, in the later summer months, that it would be strange if the Act was brought into operation on Jan. 1 without trouble in the two Northern Counties; and on the strength of that, on more than one occasion it was suggested in these columns that gas undertakings dealing with these counties should take the precaution of getting in good stocks to tide over any disturbance in deliveries during the busy gas-making season. Many undertakings, it is within our knowledge, did that; and not only so, but placed orders in

other districts, so as to have more than one string to their bow. The preparedness for trouble has been of advantage; for trouble there has been, and transport has been interrupted. Fortunately, however, the trouble is not so extensive as it was feared it would be; and there are signs, or at any rate hopes, that—notwithstanding that at many collieries work has ceased, and the indications are that some of the men would like to force the position by a strike—negotiation will finally bring about agreement. It is a point of honour with the men's leaders—the Executives of the Unions—that a peaceful solution should be effected if possible, seeing that they had before the outburst of disaffection entered into an agreement with the coal owners.

Here is a disconcerting feature of the trouble—a feature which shows that the rank-and-file of the Unions will rebel, though they give their leaders plenary powers to act for them, if the agreements to which their leaders are parties do not meet with their approval. After the great strike at the South Metropolitan Gas-Works, Sir George Livesey always said he would never again have anything to do, in the way of negotiating, with Union representatives, but would only deal with his men direct. And he never did again (perhaps it may be said he had no occasion to) acknowledge the Union leaders. What certainty now, after recent experiences, will the coal owners of the North feel in any future *pourparlers* and agreements with the Union leaders? The "leaders" can only claim to be so in name, not in actuality. In the case of Northumberland, the terms arrived at between the owners and the miners' leaders were submitted to the men, and approved—true, by only a small majority. In Durham, the Union leaders were clothed with power to arrange matters; and they used, as it appeared to outsiders, their authority effectively. Yet at one part of last week, it was estimated there were a total of 80,000 miners out on strike in the two counties—three-fourths of the number being in Durham, in which county there are about 149,000 miners. The Durham men have severely condemned their leaders for putting their signatures to an agreement without first submitting the terms to them. It is all very unsettling. Notwithstanding that many of the miners resumed work yesterday, this does not imply satisfaction with the new system; and the matters still outstanding at the time of writing are so complicated that it cannot be said the northern coal industry is yet "out of the "wood." With men working in discontented spirit there may be a rupture of producing continuity at any time.

The chief point of resentment is the three-shift system. The Act, however, gives the men no power over the duration of mining, beyond the limitation as to the hours of the individual. But the miners want to control everything, no matter what effect their desires have upon the coal requirements of the country. In certain collieries where the two-shift system was in operation last week, there was dissatisfaction; the "putters" declaring that there was a serious reduction of their wages. This shows the difficulty of conciliating interests. What is wished is that in the first place the night shift shall be abolished altogether. There seems, however, a disposition now on the part of a majority of the men to give the new system a practical trial. And then in the event of continued dissatisfaction——well, that is a matter that may be left to the future. Apart from general issues, the additional uncertainties that have been introduced into coal dealings by the new Act cannot fail to have the effect of inducing large buyers of coal—such as are gas undertakings—in self-protection to distribute, more than of old they were wont to do, their patronage.

Coalite Gas and Electricity Generation.

The British Coalite Company are still trying to get rid of their gas at Barking. The schemes for doing this have been many. They tried the Gas Companies; but the Gas Companies preferred relying upon their own plant for meeting their statutory obligations. The Company then proposed the promotion of a Bill in Parliament for distributing the gas in East London for power purposes; but they had not considered the scheme in all its bearings—had not considered the opposition of established gas suppliers; had not considered the fact that Parliament long since put an end to gas competition, with all its inconveniences and wastefulness, in London; and had not considered the question of the capital cost of distribution in relation to the prices manufacturers are prepared to pay for gas for power purposes. That scheme no sooner saw the light of day, than these things were forced upon the notice of those responsible for its birth, and they promptly strangled their offspring by withdrawing the Bill. Another attempt was made to get the Gas Companies to take the gas; but they again declined with thanks. Then the Directors drew a pretty picture, in order to buoy up the hopes of the shareholders, of large factories being built by manufacturers round the Barking coalite plant, with the express object of using the gas for power purposes. Manufacturers have shown no particular desire to relieve the Directors from their difficulty by erecting factories. Now there is another project on the carpet. Sir William Preece, of electrical fame, is the Chairman of the British Coalite Board; and it may be presumed that his hand has been the guiding one in the new scheme. It is that the gas shall be used for the generation of electricity, and that it shall be supplied in bulk to the Barking District Council. Terms have been submitted by the Company to the Council; and the Electrical Engineer has been directed to report upon them. The point to which the costs of electricity generation have descended in quite ordinary central stations will not, taking into consideration capital expenditure on the electrical machinery and running costs, leave much profit on coalite gas to build up the profits of the ill-starred Company.

Seeking Business Further Afield.

It will be seen from the foregoing that the British Coalite Company are making a desperate struggle for life. They are in fact losing no opportunity now. Last week it was seen from our columns that the Glasgow Corporation are considering the question of the use of gas-fires in relation to the abatement of the smoke nuisance. The British Coalite Company have apparently seized the opportunity for advertising in the "Glasgow Herald" that they are prepared to enter into contracts for the erection of coalite plant in any part of the United Kingdom for existing gas undertakings and companies requiring cheap power. The baits thrown are these: "Illuminating power of gas from 14 to 20 candle, according to requirements, supplied at 25 per cent. lower than gas companies' present cost of manufacture. . . . Gas for gas-engines can be supplied at a price which will lower the present cost of electric current by over 25 per cent." The Glasgow Gas Department are in the position to supply all the smokeless fuel required by the citizens, without the intervention of the British Coalite Company; but possibly the latter think a little pressure will be brought to bear on the Corporation by non-technical readers of the advertisement on learning that, "in districts where these plants are installed, a considerable supply of coalite—the economical smokeless fuel—will be obtainable, and will assist in mitigating the great smoke nuisance." The Glasgow Corporation have a Chief Gas Engineer on whose advice they rely in matters appertaining to the manufacture of gas and coke, both of which are smokeless fuels; the former being free of the labour, dirt, and inconvenience associated with all solid fuel fires—coalite not excepted.

Last Year's Coal Exports.

The foreign trade returns have now been completed for the past year; and what is described by one commentator as a most unsatisfactory feature is the increasing cheapness at which buyers abroad can secure our coal, while there has been no general corresponding reduction for the home consumer. Last year 65,694,267 tons of coal were exported, compared with 65,180,649 tons in 1908. But the amount received was only £37,129,978, against £41,615,923 in the preceding year—a decline of £4,485,945, though 513,618 tons more were exported. If the figures are averaged, it will be remarked that the price paid last year was within a fraction of 1s. 6d. per ton lower than in 1908. A shilling per ton export duty last year would have produced £3,284,713; and foreign buyers would still have been nearly 6d. per ton better off than in 1908, or in the total £1,201,232.

A copy of the "Eastern Province Herald" of Port Elizabeth for the 20th ult., just to hand, records that the previous Friday night the officials connected with the South African Lighting Association assembled at the office to bid farewell to the Assistant-Manager, Mr. R. E. Taylor, who was leaving for England on the completion of his engagement; and they took the opportunity of presenting him with a silver jackal Kaross as a small memento of his stay in Port Elizabeth. Mr. W. Arnott, the Manager, in making the presentation, voiced the feeling of the staff in saying how sorry they all were to part with Mr. Taylor.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 121.)

THE week just concluded on the Stock Exchange was only moderately good. There was no enthusiasm, and business was rather humdrum. Then the inevitable reactionary swing of the pendulum after the rise set in early, and started realizations; and a factor unwelcome in the Consols market was the large new Indian issue. The new year opened fairly well though quietly, but markets were not uniformly strong. On Tuesday, selling was the order of the day; and most of the best markets were down. Consols fell ¼; and Railways were dull. So were the speculative departments as well. Movements were unsettled and irregular on Wednesday; and (with the exception of the Foreign Market, which was firm all the week) prices were mostly lower. Consols were depressed on Thursday by the cause already mentioned, and fell $\frac{5}{16}$; and the gilt-edged division in general were rather poor. Friday was a dull and inactive day; the general tone of most markets being lifeless and irregular. But on Saturday things mended; and there was a gratifying recovery in several good lines. Consols rose ⅛; and other choice descriptions and Railways were firm. In the Money Market the supply was abundant at easy rates, but discount was pretty firm. The Bank rate was lowered on Thursday, according to expectation, from 4½ to 4 per cent. Business in the Gas Market was more active than of late, and the tendency was quite firm. Several issues made moderate advances in value; while none receded. A change will be noted in the Stock and Share List; Alliance and Dublin 10 per cent. and 7 per cent. shares being consolidated into one stock. In Gaslight issues, the ordinary was active and strong—the opening price of 103¼ being soon left behind. The stock afterwards changed hands repeatedly up to 104½—a rise of ½. In the secured issues, the maximum marked 88½ and 88⅝, the preference 104¾, and the debenture 81½ and 82½. South Metropolitan was only moderately busy, but very firm; transactions ranging from 120½ to 121½. Commercials were quiet. The 4 per cent. made 109½ and 110¼; and the 3½ per cent., from 103½ to 104¾. Among the Suburban and Provincial group, Alliance and Dublin changed hands at 86, Brighton original at 219½ and 220, British at from 42¾ to 43½, and Wandsworth and Putney "B" at 139½ free. In the Continental companies, Imperial was unchanged at from 105½ to 106½, ditto debenture at 94½, Union at 97, ditto preference at 138 and 138¾, and European fully-paid at 24½. Among the undertakings of the remoter world, Bombay part-paid realized 4¾, Buenos Ayres from 14¼ to 14½, ditto debenture 98½, Melbourne 4½ per cent. 100½, Primitiva 7⅛ and 7¼, ditto preference from 5⅛ to $5\frac{5}{16}$, ditto debenture 97¾, River Plate 17⅛ and 17¼, and ditto debenture 98⅝.

ELECTRICITY SUPPLY MEMORANDA.

False Pretences—Increased Prices for Electric Current at Dublin—In Bad Case—Educating Warrnambool—Choice Surpluses and Otherwise—Rash Statements.

THE result of the inquiry into the Clapham fire is noticed in our editorial columns; there is therefore little comment it is desired to make here. The origin of the fire has now been, beyond any question, traced to the bursting of an incandescent electric lamp. Both the electrical contractor who carried out before Christmas the installation of extra lamps at Messrs. Arding and Hobbs' shop and Mr. Sidney G. Russell, the Electrical Expert of the Phœnix Fire Office, knew quite well, previous to the fire, that in the best of regulated installations there is this ever-present risk of lamps bursting. If the inquiry over the melancholy occurrence has done nothing else, it has nailed this particular spurious coin—the absolute safety of electric lighting—fast to the counter. Obtaining custom under false pretences is one of the things to which the electrical industry has long accustomed us; but such proceedings cannot be for ever hidden. We may take it that the Edison and Swan United Electric Light Company, Limited, do not use gas on their premises in Queen Street, City, nor would there be any occasion to have matches in the basement. But there was a fire in the basement of the establishment early last Monday morning—a fire that was at first regarded as a perilous one by the Fire Brigade. Says one report, "As soon as the basement windows were broken in, volumes of dense, acrid, suffocating smoke (due probably to the material with which electrical apparatus is insulated) poured out." However, the fire was soon got under.

The Dublin Corporation have at length had to come to an increase in the charges for electricity. Their financial advisers have told them the step is imperative, and that the financial position of the undertaking is unsound, which unsoundness has been accentuated by the consumption reducing power of the metallic filament lamp, which is good for the consumer, but which makes it more difficult for electricity undertakings to earn a living. There was—this is customary—some plain speaking at the meeting of the City Council yesterday week, when the motion was brought forward for an increase of the charges by 10 per cent. Some members thought the management of the undertaking was at fault; and another member did not seem at all surprised that consumers had not confidence in the electric light when it failed three times in as many months. But, in regard to financial unsoundness, the truth of the matter is that it is not so much the management as the fact that the electrical industry has not applied commercial discretion to the charges made for services rendered. The increase at Dublin will do something to put things in better condition, and to relieve the ratepayers from ever-recurring deficits. It was a pertinent question that was put by one member during the discussion: Were the general body of ratepayers to put their hands in their pockets to pay for the privileges and advantages of the comparatively few who use the electric light? The answer was found in the voting. That the Dublin City Council are regarding the position very seriously is shown by the fact that a year ago the proposal for an increase was rejected, while on this occasion 47 members voted in favour and 8 against it. There is no doubt the Corporation will be told they have taken a retrograde step; but when things are going from bad to worse on deficit-producing prices, how far is this to be allowed to proceed to please those who look with horror upon this so-called playing into the hands of the enemy. The fearful fuss that is made by the electrical people over increasing the price of current is humorous in view of the glorious advantages set forth for electricity. Despite all the disadvantages of gas (as drawn and imagined by our electrical competitors), the administrators of gas undertakings do not make any trouble, when need commands, about raising the price they charge for it. Why the difference? We know, and so do our electrical friends. But we have only just been through the period of peace and goodwill; so the point may be passed.

The charge is occasionally preferred that, in portraying matters electrical, we choose our pigments for the express purpose of imparting a high tone. To this, we do not assent. What is submitted is open to the inspection and judgment of all our readers; and we are content to leave it there. There is present satisfaction in learning that in reviewing last week the past year's affairs of the electrical industry, so far as they interest our readers, we did not exhibit the general position in too drab colours. Dealing with some of the electrical events of the year, the "Electrician" remarks that most of its readers will be glad that 1909 is over. A year earlier our contemporary expressed the opinion that things electrical could not be much worse during 1909 than they had been during the year preceding; and it even looked forward optimistically to better conditions. Ruefully it is now written: "Our optimism has been shattered. No examination of the bright side of things, no extended study of trade returns, no involved mathematical calculations based on peculiar units, can obscure the fact that the electrical industry has, during the past year, been in just about as bad case as it is possible for any industry to be. Whether during 1910 it will be even more unsuccessful, or whether it has at last touched bottom, we prefer not to prognosticate. Our attempted prescience of 1909 gives no encouragement to prophesy upon the events of 1910." This want of electrical success appears to be only on the commercial side. Admittedly, the industry has done very well technically, excepting in the matter of producing really practicable appliances for domestic heating, cooking, and water-heating. In regard to the last-named domestic operation, it was not long since the "Therol" water-heater was extolled in the columns of the technical press in a remarkable manner. Now we read that, in the class of apparatus "possessing the properties of interesting design and great possibilities, but just at the moment having no great practical application, may also be placed the 'Therol' water-heater. To use this apparatus satisfactorily, a revision of the existing tariffs for electricity supply is necessary, and a closer combination between manufacturers and station engineers essential." The present writer finds in connection with one electrical undertaking in a residential district, that the "Therol" heater has proved a distinct failure in attracting householders. Speaking of the recognition of the need for greater publicity, our contemporary says that this is "undoubtedly due to the present depression." A few sentences follow, the meaning of one or two of which is somewhat doubtful: "Great efforts have been made in most directions to secure an increase in the number of consumers, and while these efforts have been sometimes misdirected, initial errors are being gradually eliminated." We pause over the "misdirected efforts" and "initial errors," and wonder whether the writer had in mind the slanders and the mendacity directed by electricians against the use of gas, which "misdirected efforts" and "initial errors" have not relieved the industry from the judgment passed by our contemporary upon its affairs in the past year. That judgment is that the industry has been "in just about as bad a case as it is possible for any industry to be.

We may reiterate the satisfaction that it always gives us to learn how gas and electricity affairs wag in distant parts. Though Warrnambool in Australia is not a place on which the eyes of the whole civilized world are constantly fixed, there is pleasure in reading the contributions to a little gas and electricity controversy that is going on in the papers, copies of which have been forwarded to us by the Town Clerk. The controversy (which enables us to make a few comments that will have general interest) had its origin in a proposal to extend the gas-works; a shopkeeper following this up by asking consideration for the electric light. In an effort to make hay while there was a ray or two of sunshine about, an associate member of the Institution of Electrical Engineers, residing in Melbourne, and rejoicing in the name of Lascelles Parrington, wrote to the "Warrnambool Standard" pointing out that figures and statements quoted from the

"JOURNAL," "and other papers full of 'gas,'" were "most extraordinary and unreliable." Then this gentleman proceeds to try to make the mouths of the inhabitants of Warrnambool water by quoting the profits of electric lighting from such places as Glasgow, Manchester, Oldham, Sheffield, Liverpool, and Halifax. Now let us suggest to Mr. Lascelles Parrington, that it would have accorded better with the general fitness of things had he quoted the results from towns at home on an equality with Warrnambool, and not from towns representing the choicest industrial and trading centres of Great Britain. But we will meet him on his own ground. The electrical surpluses of these specially favoured towns are for the year 1907-8. When Mr. Parrington has had an opportunity of studying the figures for a year later, he will find that the surpluses have shown a fairly considerable decline. He says that Glasgow had a surplus in 1907-8 of £51,062; but for 1908-9, it had dropped to £49,175. He gives the total receipts for electric lighting and power as £249,569. Against this we quote, from the last Board of Trade returns, Glasgow's gas receipts of £1,006,152. Manchester, Mr. Parrington next mentions, exhibited in 1907-8 a surplus of £59,543; in 1908-9. the figure had descended to £33,495. He next states that Sheffield obtained from public electric lighting alone in 1907-8 no less than £48,111. But, in the "Electrician" tables issued last January, we see that there were only 50 flame arc lamps in the streets; so that they were, if Mr. Parrington is correct, charged out at the rate of nearly £1000 each! On the other hand, the Board of Trade gas returns state there were in 1908-9 11,102 gas-lamps in the streets of Sheffield. But, in 1907-8, he proudly adds, Sheffield made a surplus of £4796; the department, in 1908-9, only had half that surplus (£2423). Then Liverpool's surplus of £51,532 in 1907-8 dropped in 1908-9 to £42,854. Halifax, with a surplus of £3161 in 1907-8, only shows £768 for 1908 9. So much for Mr. Parrington's "extraordinary" and somewhat "unreliable" figures.

Instead of picking out the choicest areas for the guidance of Warrnambool or any other place, let us take the tables published in the "Electrical Times" on Dec. 30 last, and see what tale they unfold. It is not a pleasing one for electricians. The accounts of some 199 local authority electricity undertakings are analyzed; and we find this: 59 of them did not make a profit at all, but a deficit; 43 made under £500; 31 between £500 and £1000; and 66 above £1000. Now what on these figures comes of Mr. Parrington's argument, based on exceptionally well-placed concerns, with districts that are luxuriant in opportunities for both gas and electricity business? Many local authorities in other districts in this country have regretted the day they launched out into electricity supply; many of the towns have suffered year after year the provision of the money from the rates to make good deficits; many of the undertakings showing surpluses of less than and over £1000 have not put by a penny piece to reserve or depreciation; and the Local Government Board have shown time and again the financial unsoundness of several of these undertakings.

One or two other points from Mr. Parrington's most misleading letter. He states that in London thousands of gas-lamps have latterly been replaced by flame arc lamps. We should like to know where those thousands are to be found. Where there has been conversion to any extent of gas-lamps to electricity, it has invariably been in districts where the electricity supply is a municipal affair, and has been done entirely to give the electricity concerns the business, at the expense of the ratepayers. In such cases, local government has turned topsy-turvy. The interests of the electricity undertaking is of primary importance; those of the ratepayers of secondary moment. The Local Government Board have refused loans for the conversion of public lamps, on the ground that, with modern incandescent gas lighting, there is no justification to be found for change to electricity either in cost or in efficiency. The London County Council declined a loan to Marylebone on the same ground; but the Marylebone Council have been making the ratepayers pay the heavy costs of conversion so far as it has gone. But about this lamp conversion that is proceeding by the thousand, the Board of Trade returns show that ten years ago the number of gas-lamps in the districts of statutory gas undertakings in the United Kingdom numbered 581,206; in 1908-9 the total was 700,696. We will not traverse all the veracious Mr. Parrington's statements, but respecting a quotation from "a noted authority"—one Maurice Solomon—we should much like to know something more about it. The quotation reads: "According to figures published by the Imperial Continental Gas Association the least efficient of the electric lamps was about twice, and the most efficient about twenty times as good, as a lighting source, as the best of the gas lamps." The tests of Professor Drehschmidt, the Chief Chemist at Berlin, tell a different story. When were the figures referred to published by the Imperial Continental Gas Association, and where? We think there is some error about the quotation. Evidently it will be news to Mr. Parrington that the metallic filament lamp will give 800-candle-hours for one unit of electricity; while approximately 35 cubic feet of gas will, with modern inverted gas-burners and ordinary pressure, also give 800 candle-hours. Now we ask whether any of the figures or statements made here are "extraordinary and unreliable." They are all to be verified from electrical papers or official returns, excepting the one as to efficiency. That can be proved in a photometer room. It is no use trying to get electrical business under false pretences, misleading statements, and incomparable conditions. That game has been played in this country for many years; may Australia succeed in keeping free from it!

PERSONAL.

Mr. FRED SMITH has been appointed Secretary and Manager of the Church Stretton Gas Company, Limited, in place of Mr. E. Wilkinson, resigned.

Mr. HUGH WILSON, son of Mr. David Doull Wilson, whose recent death is noticed elsewhere, succeeds his father as General Manager of the Tees Valley Water Board.

Mr. WILLIAM COLLINS, the Manager of the Porthcawl Gas-Works, has been appointed Manager of the Coquimbo (Chili) Gas-Works. Mr. Collins will sail early next month for his new sphere of labour.

The completion by Mr. JOHN PHILLIPS, the Secretary of the Bristol Gas Company, of fifty years' service, was signalized by a banquet held last Wednesday evening in the large hall at the Company's offices. Alderman Dix, the Chairman, presided; and he was supported by all the Directors, with one exception.

Mr. A. FRANCIS, who (as was briefly recorded in last week's "JOURNAL") retired at the end of the past year from the position of Secretary of the Tavistock Lighting, Coal, and Coke Company, has been presented by the employees of the Company with his portrait. The presentation was made on behalf of the subscribers by Mr. H. T. Doble, the Chairman of the Directors, who said that all connected with the Company regretted the retirement of Mr. Francis, who had for many years served the Company faithfully, and to whose clever and careful management, to a large extent, they owed their present favourable position. It was not the shareholders and employees only who felt regret; for if any difficulties or disputes had arisen with customers, they were soon smoothed over by Mr. Francis's genial and gentle disposition. By the Directors, with whom he had been associated for so many years, and who most thoroughly appreciated his advice and valuable services, the loss was felt very deeply. All employed on the gas-works, from the oldest man to the youngest boy, admired and respected Mr. Francis. He had endeared himself to them, not only as a master, but as a true friend. He had studied their interests, and by doing his best for the men had served the Company as well. Mr. Francis, in accepting the presentation, spoke of his long connection with the Company, extending over a period of 35 years—first as a Director, then as Auditor, and for nearly twenty years as Manager and Secretary, and latterly as Secretary. He cordially thanked them for the good feeling which prompted the presentation.

OBITUARY.

By the recent death, at his residence in Middlesbrough, of Mr. DAVID DOULL WILSON, the Tees Valley Water Board have lost the services of their General Manager—a position he had held for more than a quarter-of-a-century. Deceased was born in Aberdeen, and went to Middlesbrough at the age of 16. In 1868 he entered the Town Council, and was for ten years Chairman of the Finance Committee. He had also been Mayor. He was in his 75th year.

The death occurred recently of Mr. WILLIAM THOMPSON, an old official of the Blackburn Corporation. Deceased, who was 70 years of age a few days before his death, was seized with influenza. He at first made favourable progress; but pneumonia supervened. Mr. Thompson was a native of Blackburn, and had been connected with the Gas Department, of which he was Chief Clerk, for the long period of 52 years—serving first under the Gas Company and subsequently under the Corporation. The funeral, which took place amid many manifestations of sympathy and regret, was attended by a large deputation from the staff of the Gas Department.

The death occurred last Wednesday morning, at his residence at Wallsend, in his eightieth year, of Alderman GEORGE AWBURN ALLAN, one of the best-known public men in the district. He was one of the first members of the old Local Board, formed in 1866; and he subsequently became Chairman of the Urban District Council. He was one of the most prominent Freemasons in the county of Northumberland. At one time he was Manager at the cement works of the late Colonel Addison Potter, at Willington Quay; but until only a short while ago, when he retired, he had occupied an official position under the Newcastle and Gateshead Water Company. On the death of Mr. Thomas Crawford, Alderman Allan was unanimously elected by his co-Directors as Chairman of the Walker and Wallsend Union Gas Company.

We regret to record the sudden death, early last Tuesday morning, at the age of 51, of Mr. JAMES DEAS, the Water Engineer to the Warrington Corporation. On the previous evening he was attending to his duties at the Town Hall, and was subsequently present at an entertainment. During the night, however, he was taken seriously ill, and succumbed. Mr. Deas entered the service of the Corporation in 1891, when he was appointed Manager of the Longford depôt; and on the resignation of Mr. Ross, the Water Engineer, in 1895, he was also appointed to that position, holding both offices until the beginning of 1904. During the time Mr. Deas held the position of Water Engineer, several large undertakings were carried out under his supervision; and at the time of his death he was actively engaged on other water-works improvements. He leaves a widow and four children.

GAS BILLS FOR 1910.

[Second Article.]

Resuming the review of the group of Bills in which Companies are seeking incorporation under parliamentary powers, there are six additional measures to be noticed.

From the preamble of the Bill promoted by the Havant Gas Company, Limited, it is gathered that the share capital authorized by the Company's Order of 1879 consists of £3000 original capital entitled to a standard dividend of 10 per cent., and £10,000 additional capital entitled to a dividend of 7 per cent. With the exception of £4500 of additional capital, the authorized capital has been subscribed and fully paid up, and the Company have borrowed on mortgage of the gas undertaking, £2500. In applying for statutory powers, it is proposed to extend the area of supply so as to include so much of the parish of Idsworth as lies within a mile of the northern boundary of the limits of supply defined by the Company's Provisional Order of 1879. The capital authorization contemplated is £23,500, in 4700 shares of £5 each. This capital it is intended to class as follows: £3000 "A" ordinary shares; £5500 "B" ordinary shares (the "A" and "B" shares representing the original capital); and £15,000 additional capital, or "C" shares, not more than half of which is to be raised as preference capital. The standard dividend on the "A" shares is 10 per cent., and on the "B" and "C" shares 7 per cent., excepting so much as is raised as preference capital, and on that a dividend of 5 per cent. may be paid. The carry-forward is limited to the equivalent of a year's dividend. The new auction clauses are to apply to the new capital. Special purposes and reserve funds are provided for. Inclusive of £2500 already borrowed, the Company are to be allowed to borrow one-third part of the amount of the issued capital. The standard price of gas is proposed at 4s. 3d. per 1000 cubic feet, with the sliding-scale operating on the ordinary terms. The usual prepayment meter clause appears; and a discounts clause is included providing for not exceeding 10 per cent. for prompt payment, and up to 20 per cent. for large consumption, although (according to an earlier clause in the Bill) section 13 of the Gas-Works Clauses Act, 1847, is to be altered in manner that eliminates the necessity for the express limitation of discounts. The illuminating quality of the gas is proposed at 14 candles, tested by the "Metropolitan" No. 2 burner. There are sundry references to electricity in the Bill; but we do not see in it where the Company take powers for either generation or distribution. [*Parliamentary Agents: Messrs. Baker and Co.*]

In 1889, the Mallow (Cork) Gas Company, Limited, was formed, for the purpose (*inter alia*) of manufacturing and selling coal gas, oil gas, electricity, and any other form of artificial light. Gas is being supplied by them in the town. Under the Memorandum of Association, the share capital was fixed at £2000, divided into 400 shares of £5 each. In 1905, the nominal capital was increased by the addition thereto of the sum of £3000, also divided into £5 shares. Five per cent. mortgage debenture bonds have been issued to the extent of £1500. The Company now seek to come under parliamentary powers. We will not attempt to reproduce the townlands representing, in addition to the urban district of Mallow, the proposed limits of supply. The share capital asked for is not to exceed £11,000, consisting of the £5000 share capital already raised (to be known as the original capital), and £6000 of additional capital. The new auction clauses apply to the issue of further capital. Dividends are proposed to be limited to 10 per cent. on the original capital, 6 per cent. on the original preference capital, 7 per cent. on the additional ordinary capital, and 6 per cent. on as much of the additional capital as may be issued as preference capital. The borrowing powers are limited to one-third. Provision is made for special purposes and reserve funds. The standard price for gas is named at 5s. 3d., with the sliding-scale operating half-yearly on the usual conditions. The prepayment meter clause is in the ordinary form. The prescribed illuminating power is 14 candles, tested by the "Metropolitan" No. 2 burner. The Company ask for authority to apply, if they think fit, for a Provisional Order for electric lighting powers. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

In the excellent belief that a proper and sufficient supply of gas to Maltby and certain surrounding places in the West Riding of the County of York would be of public and local advantage, the Maltby Gas Company has been formed, and statutory powers are being sought. The scheme contemplates a capital of £24,000 in 4800 shares of £5 each, with one-third borrowing power. Authorization is asked for the formation of a special purposes fund. Power for the compulsory purchase of gas-works lands is sought. The maximum price of gas is placed at 5s. 3d. per 1000 cubic feet; and the prescribed illuminating power of the gas at 14 candles, tested by the "Metropolitan" No. 2 burner. It is proposed to enact that the maximum price to be charged by the Company for gas supplied for public lighting shall not exceed a rate equal to the price charged to private consumers, less 10 per cent. The Company ask to be empowered to purchase, by agreement but not otherwise, the undertaking of the Dinnington and District Gas Company, Limited, upon such terms and conditions as may be agreed upon between the parties concerned. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Tipperary Gas Company, Limited, was formed in 1882 for the purpose of supplying gas or any other illuminating or heating agent in the town or elsewhere within a radius of 4 miles from the then boundary of the township. The land on which the gas-works stand is held on lease for a term of years, having 68 years to run. The share capital of the concern was fixed by the Memorandum of Association at £10,000. The Company have created 5 per cent. mortgage debenture bonds to the extent of £3330, of which £2280 has been issued. The Company now seek to be established under statutory powers. An enlarged area of supply is defined; and the share capital asked for is £17,000, representing £10,000 original capital, and £7000 additional, to be issued under the new auction clauses. The dividends are limited to 10 per cent. on the original ordinary capital, 5 per cent. on the original preference capital, 7 per cent. on the additional ordinary capital, and 6 per cent. on such part as may be issued as preference capital. There are the usual clauses for special purposes and reserve funds. The standard price suggested is 5s. per 1000 cubic feet, with the sliding-scale operating half yearly on the ordinary lines. Clauses referring to prepayment meter supply, prescribing 14-candle gas, and the "Metropolitan" No. 2 burner for testing, are all in the common form. The Company are also asking for sanction to apply, if thought fit, for a Provisional Order to enable them to supply electrical energy. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The Whitland Water and Gas Company are up seeking for incorporation and statutory powers to enable them to supply water and gas in certain parishes in the counties of Carmarthen and Pembroke. The Company was formed under the title of the Whitland and District Gas and Water Company, Limited; and by it gas is being supplied in Whitland, but no water-works have been constructed. The preamble of the Bill mentions that by an order, dated March 26, 1909, made in an action in the High Court of Justice, wherein Messrs. R. & A. Main, Limited, were the plaintiffs, and the Limited Company the defendants, Alexander Constantine Hutchins was appointed receiver of all the property and assets of the Limited Company. An agreement has been entered into on behalf of the Company for the purchase of the undertaking of the Limited Company. The agreement appears as a schedule to the Bill. It recites that the nominal capital of the Limited Company was £25,000, divided into 2500 ordinary shares of £5 each and 2500 preference shares of £5 each; but only about £4025 of such capital has been subscribed. The Limited Company also raised a sum of £4900 by the issue of a series of 490 first mortgage debentures of £10 each. The erection of gas and water works was commenced by the Company; but the share capital subscribed and the money raised by debentures were insufficient to enable them to complete the scheme. The Company have been unable to raise any further capital, and have made default in payment of the interest upon the debentures. Then follows the information as to the appointment of a receiver and manager. The agreement is made between the receiver and manager and Mr. Joseph Lewis Hampton; and, subject to the approval of the High Court, it provides for the purchase of the undertaking on arbitration terms. The promotion of the present Bill stands as part of the agreement. Turning to the clauses, the capital proposed by the Company is £15,000, in 3000 shares of £5 each; together with borrowing powers to the amount of one-third. Provisions are embodied in the Bill for reserve and special purposes funds; and another clause provides for the confirmation of the agreement for the purchase of the undertaking of the Limited Company. The water section of the Bill can be left for notice with the measures specially dealing with water. As to the section referring to gas supply, the area is defined; and all the necessary powers are included relative to manufacture and distribution. The maximum price of gas is not to exceed 4s. 6d. per 1000 cubic feet. The standard illuminating power is proposed at 14 candles, tested by the "Metropolitan" No. 2 burner. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Wicklow District Gas Company, Limited, were incorporated in 1907 under the Companies Acts; and they have gas-works on lands held on lease for a term of years having 97 years to run. The share capital of the Company was fixed by their Memorandum of Association at £12,000; and they have issued ordinary shares to the extent of £9000, cumulative preference shares to the extent of £1100, and mortgage debenture bonds to the extent of £2400. The proposed share capital of the Company is £16,100, consisting of the share capital already raised of £10,100, and of £6000 additional share capital, to be issued under the new auction clauses. The limits of dividend are 7 per cent. on the original ordinary capital, and 6 per cent. on the original preference capital, with similar dividends for the respective classes on the additional capital. The customary one-third borrowing power is asked for; and then follow provisions as to special purposes and reserve funds. The standard price of gas is placed at 5s. 3d. per 1000 cubic feet, with the sliding-scale operating half yearly, by 1s. 9d. variations in dividend for penny changes in price. The standard illuminating power is proposed at 14 candles, using in testing the "Metropolitan" No. 2 burner. The prepayment and other clauses are in ordinary form. Power is taken by the Company to apply for a Provisional Order for electricity supply should it be deemed advisable. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

London and Southern District Junior Gas Association.—Arrangements have been made for the members of the Association to visit, in two parties, on Wednesday and Thursday of this week, the meter works of Messrs. Parkinson and W. & B. Cowan, Limited, in Cottage Lane, City Road, E.C.

THE HAMBURG GASHOLDER DISASTER.

THE "Zeitschrift" of the Association of Gas and Water Engineers of Austria-Hungary, after complaining of the difficulty of getting information officially from the works as to the disaster which took place at the Hamburg Gas-Works on Dec. 7, reproduces from the "Installateur" (which is a technical paper published at Ludwigshafen) a report which Herr Stellkens, an architect and chief officer of the Duisburg-Ruhrort Wharves, has communicated to a local Rhenish paper. The report is interesting chiefly because it discloses some special acquaintance on the part of its author with the gas affairs of Hamburg.

Herr Stellkens, after pointing out that the tank of the new gasholder at Hamburg was the largest of its type in the world, states that the technical members of the Gas Committee of Hamburg at the time when the erection of a new gasholder was under consideration were unanimously in favour of a different construction. On the other hand, the commercial members of the Committee were in a majority, and took the view that the type of construction was of no moment, as the guarantee of the constructing firms would be sufficient. The construction followed was adopted contrary to the views of the technical members, and in spite of the warnings of authorities such as Professor E. Häseler, of Brunswick, who declared that it was statically unsound. This warning remains, he says, on record. Herr Stellkens next points out that an explosion in a gasholder which has been in use for some time is an impossibility, and that reports of explosions in coal-gas holders in which no air was present are exercises of the imagination. He then proceeds to say that in a new gasholder there is the possibility of an explosion when it is first being brought into action. The gas entering the holder forms with the air contained in the crown an explosive mixture, which must be carefully exhausted from it. The mixture of air is, he mentions, withdrawn through a pipe which extends through the crown of the holder down nearly to the surface of the water in the tank. At Hamburg, only one such pipe was, he states, used, whereas at least four should have been inserted in different parts of the crown. The first precaution to be observed in bringing such a large gasholder into use, should be that all lights, lamps, or furnaces should be removed for a distance from the holder of at least 22 yards, and in the direction of the wind at least 55 yards. At Hamburg there was a canteen underneath the gasholder, whereas no light should have been used there in December. In conclusion, Herr Stellkens remarks that he has an intimate knowledge of the site of the Grasbrook Works, and also of the particular private relations which prevailed in placing the construction of this gasholder, which relations exist in very many towns in Germany and adjacent countries. He takes upon himself the sole responsibility, under the Press laws, for his statements.

The Hamburg "Fremdenblatt" observes in regard to Herr Stellkens's statements that they are based on erroneous suppositions and faulty judgment. It is, it argues, quite a proper course in giving out the order for the gasholder to examine scientifically different projects. There was not in this case only one firm concerned; the construction was entrusted to two firms who are of good repute in the construction of gasholders, and have already erected a very large number. The causes of the catastrophe will not be definitely disclosed until the official investigation has been completed.

The "Zeitschrift" of the Austrian Gas and Water Association next proceeds to quote a report from the "Hamburger Nachrichten," of Dec. 16, as to the proceedings at a meeting of the City Council. One of the questions before the meeting was a recommendation of the Council that a sum should be voted for the reconstruction of the smaller burnt-out gasholder at the Grasbrook Works. It was proposed that the Finance Committee of the City should be empowered to transfer to the Lighting Committee for this purpose a sum of £10,000 from the Fire Insurance Fund. In the discussion which ensued on this recommendation, Herr Kümpel said that he thought that the works should be removed from the present position, on the ground that immediately adjacent to the gasholder were the passengers' waiting-rooms, in which often there were as many as 2000 emigrants. Happily at the time of the catastrophe only 80 emigrants were there; but there was a panic among these, and they were taken off on a steamer. Also some of the offices of the dock authorities were close to the site of the holder. Herr J. Rohde pointed out that the old gasholder was not the initial cause of the catastrophe. He commented also on the fact that the newspapers obtained earlier information of this proposition than members of the Council were able to do.

Reference was next made to the report of Herr Stellkens published in one of the Rhenish newspapers, and the attack which it made on the Council. It was stated that the authorities were anxious that the truth in regard to the catastrophe should be disclosed as quickly as possible, and that the investigation was being hastened forward. Herr Beit explained that originally it had been intended to erect a fourth gas-works at a cost of £1,400,000; but the purchase of a site for it had not been approved by the authorities. Herr Krause, the former Manager of the gas-works, had then brought forward a scheme for enlarging the Grasbrook Works, and it could not be said the reconstruction and enlargement of the works had been undertaken without due consideration. The scheme had been submitted to Herr Körting, the General Manager of the works of the Imperial Continental Gas Association at Berlin; and he made an exhaustive investigation of it and suggested a number of changes. This was of importance, as the authorities had been reproached with having erected too large a gas-works on such a very small area. In regard to Herr Stellkens's charges, it might be pointed out that eight firms had tendered for the construction of the gasholder; and as a result of the consideration of the tenders, the contract had been given to the Berlin Anhalt Engineering Company. There was no question of the commercial interests being opposed to the technical opinions, because the construction of telescopic gasholders was approved by all technical men. Senator Strack considered Herr Stellkens's article was the outcome of insufficient knowledge. Dr. M. Albrecht thought that, while the gas-works themselves might not be dangerous, it appeared unadvisable to store so large a quantity of gas as 7 million cubic feet close to the retort-settings. It was obvious that the leakage from the gasholder was due to a fault of construction. Such a large gasholder ought to be removed from that position. In regard to the small gasholder, he thought that the roof, which had previously been of wood, should certainly be constructed of fire-proof material. Herr Stolten remarked that the cause of the catastrophe could only be traced to a fault of working, or of design, or of material, while such a large gasholder should not have been erected near the furnaces. Gasholder explosions were comparatively rare; but in cases such as the present where an accident occurred, the cause must certainly be ascertained. It must in any case be determined how the leakage arose, and the responsibility must be brought home to the person at fault. Herr Gutknecht pointed out that if water had been available at the proper place and time, the catastrophe to the old gasholder would not have happened. This gasholder was not so lofty; and he wished to know why the Fire Brigade had not been able to save the roof. Dr. Wolffson thought that it was the duty of the Lighting Committee to institute proceedings for slander against the author (Herr Stellkens) of the article in the Rhenish paper. Herr Kümpel in a second speech said that the gas-works constituted a great danger to the adjacent docks and wharves, and the question should be thoroughly discussed whether they should not be removed to another site. Herr Paevlow said the real question was whether a concrete roof was not dangerous. Herr Hennicke remarked that every effort had been made by the admirable City Fire Brigade to get water on to the roof of the gasholder, but it was a very difficult matter, and they had been unsuccessful. Herr J. Rohde interposed to observe that it had been clearly shown that the Fire Brigade ought to be better equipped. After a few further remarks, the discussion was closed, and votes were taken first on a motion by Herr Kümpel objecting to the reconstruction of the old gasholder, on the ground of the danger it presented to the emigrants' accommodation, This motion was lost. A motion by Dr. Albrecht, to the effect that the roof of the gasholder house should be constructed of incombustible material, was also lost, and the original recommendation of the Council was finally carried.

The December number of "Het Gas" contains a short notice of the Hamburg catastrophe, based chiefly on the report given of it in the "JOURNAL" for Dec. 14. It points out, however, that tanks of somewhat similar construction exist in Holland at the Rotterdam and the Hague Gas-Works. The one at Rotterdam is for a holder of 30,000 cubic metres (= 1,060,000 cubic feet) capacity; but the interior of the annular tank is closed up and inaccessible. But the tank of the holder of 70,000 cubic metres (= 2,472,000 cubic feet) capacity at the modern Trekvliet works at the Hague is of the raised annular type, and the interior chamber or vault is roofed over, and is used as a store. The roof, however, is of iron sheets, covered with water to a depth of 6 or 7 inches; whereas the roof of the chamber of the large holder tank which collapsed at Hamburg appears to have been mainly constructed in cement concrete. The gasholder at the Hague was described, with a view of the holder and a section of the annular tank, in the account of the Trekvliet works which was given in the "JOURNAL" in February, 1908 (Vol. CI., pp. 290, 291). The holder, however, rises to a height above the ground level of only 174 feet, as against 246 feet for the Hamburg holder; while the diameter of its tank outside is only 174 feet, as compared with about 243 feet for the Hamburg tank. Notwithstanding the smaller dimensions of the gasholder at the Hague, the similarity of its construction with that of the holder which has failed at Hamburg must recall attention to it. A second similar gasholder is at the present time being erected at the Trekvliet works at the Hague.

Manchester and District Junior Gas Association.—At the next meeting of this Association, which will be held in the Victoria University, Manchester, on Saturday afternoon, two papers will be read—one by Mr. A. L. Holton, entitled "Notes on the Manufacture of Sulphate of Ammonia;" the other by Mr. S. Carter, on "Some Experiences with Carburetted Water-Gas Manufacture." We learn from the Hon. Secretary (Mr. J. Alsop) that the return debate between the members of the Association and those of the Manchester Students' Section of the Institution of Electrical Engineers, on the subject of Gas *v.* Electricity for the Production of Heat and Power," will take place at the Municipal School of Technology, Manchester, on the evening of Tuesday, the 15th prox.

PRECAUTIONARY MEASURES WITH GASHOLDERS.

THE "Zeitschrift" of the Association of Gas and Water Engineers of Austria-Hungary of the 1st inst. contains an article by Herr Walter Licht, of Vienna, on the precautionary measures which, according to his experience, should be followed in bringing new or repaired gasholders into action, and in making ready gasholders which have been in use for repair. The article is prompted by the reports of the gasholder catastrophe at Hamburg; and its object is to suggest precautions which the author's wide experience with starting new and letting down old gasholders leads him to believe will be of benefit to those of his colleagues in the industry who may occasionally be called upon to superintend such operations.

When a holder is about to be brought into use, it is necessary that the contained air should be displaced by gas. The first step, however, with a new holder is to raise it repeatedly with air, in order to see that the guide-rollers act properly, easily, and silently. With telescopic holders, the cupping and uncupping should take place without a hitch; and it must be ascertained that the cups are absolutely sound. It has been known, for instance, that a rivet has been omitted from one of the cups, and the hole merely lightly filled in with red lead and paint, so that it was only after the lapse of a little time that unsoundness was disclosed. If there is a steam-pipe for warming or stirring the water in the cups in winter time, care must be taken that the water cannot be syphoned out of the cups by this pipe. The tank and cups should be closely examined, to see that pieces of wood or tools or other working appliances have not been forgotten or dropped in, as they might cause serious interference with the rising and falling of the gasholder or the cupping and uncupping of the lifts.

In order to test the soundness of the valves, the inlet and outlet connections to the holder should be filled up with water before the holder is raised with air. Water is more readily and rapidly applied than blank flanges. After the bell is raised its soundness must be tested by a thorough application of soapy water. The pipe by which the holder is blown off should pass through the highest point of the crown, and extend nearly down to the surface of the water in the tank. A small outlet-pipe with pet-cock may be provided on the pipe by which the holder is blown off, in order that samples of the mixture of gas and air may be taken in a small bladder and tested in the laboratory. The men engaged on the holder at the time should wear india-rubber shoes, in order to avoid striking a spark. Watchmen should, if the local conditions necessitate the precaution, be placed round the holder, so as to prevent people who are smoking approaching it. A day should, if possible, be chosen for blowing out the holder when the wind is not blowing towards the retort-house or the boiler-house. All flames in the neighbourhood of the holder should be first extinguished. The day also should be free from thunderstorms. The blowing-off should be started early enough in the day to admit of finishing off the whole operation before dusk. In blowing out the holder, the valves should only be opened sufficiently to raise it gradually.

When it is necessary to let down a holder which has been in use, for repairs or cleaning, the gas remaining in the bell must be expelled by air. The blowing-off pipe must in that case not be prolonged inside the holder. The outlet-pipe must be filled with water, and remain filled with it till the holder is again put to work. It must be ascertained with certainty that the valve on the inlet-pipe is perfectly tight; and, in order to ensure that air does not find its way through this valve into the system of mains, it is safer to cut off the inlet-pipe from the works main by a blank flange. The air is then blown through the inlet-pipe by means of a pump or an exhauster, so as to raise the bell gradually. As soon as the blowing out of the holder is finished, the inlet-pipe should be filled with water. In some cases, the author has had the free end of the blowing-off pipe made to dip into a vessel of water. The walls of the vessel must be of sufficient depth to prevent the water being splashed over them. The dip, or depth to which the pipe passes into the water, must naturally be settled for each particular case according to the prevailing pressure. The blow-off pipe must not be of too small size; otherwise the operation takes too long, and the chances of an explosion are thereby considerably increased. Where the gasholder happens to be enclosed in a building, the blow-off pipe must, of course, pass outside the building.

The method of blowing off through a water-seal obviously can be applied also to the blowing out of large new distributing mains, if they are not blown out with chimney gases according to Dr. Strache's system. When the Imperial Continental Gas Association some years ago were bringing a new stretch of 36-inch main into action in Vienna, the outlet-pipe was made to dip into a stream of water, in order to avoid risk of accident. It is easy to arrange apparatus for the blowing out of mains and apparatus in a portable form with a water-seal.

The foregoing are general precautions, which may need to be supplemented according to local conditions. It would be useful, the author considers, if his colleagues in the industry also would put on record the precautions which they have been accustomed to adopt in blowing out gasholders, &c.

LOCAL ADMINISTRATION AND TAXATION.

THE annual reports of the Local Government Board have grown so bulky of late years, that it has been necessary to issue in two parts the one dealing with the general work of the Board; a separate volume being devoted entirely to the proceedings of the Medical Department. Part II. of the thirty-eighth report, covering the year 1908-9, has lately been published; and, as on previous occasions, we shall reproduce from it some of the statistics relating to local administration and taxation. The various subjects are arranged in three groups: (1) The work of County Councils under the Local Government Act, 1888; (2) public health and local administration; (3) local taxation and valuation. It is with statistics contained in the last two groups that our readers are specially concerned.

Since the constitution of the Board in 1871, they have sanctioned loans by urban and rural authorities amounting to £184,262,578, of which £6,531,401 was authorized in the year ended Dec. 31, 1908. This sum was divided between the two classes of authorities as follows: Urban councils, £6,009,741; rural councils, £521,660. Under the Public Health Act and Local and Confirmation Acts, the Board sanctioned loans to the amount of £4,552,673, of which £1,592,890 was to be spent on street improvements, &c., £1,026,857 in connection with the sewerage of towns and villages, £325,795 on gas-works, £369,524 on water-works, and £290,015 on the provision of public walks and pleasure-grounds. The amount sanctioned for water-works was divided thus: Urban councils, £248,058; rural councils, £121,466. The borrowings by local authorities for electricity supply purposes under the Act of 1882 continue to be heavy. In 1891 they amounted to £115; in 1901, to £3,995,459; and in 1908, £1,377,268. The total amount borrowed between 1890 and 1908 (both inclusive) was £25,550,546, the whole of which was required by town and urban district councils, with the exception of two loans of £20,000 and £7000 authorized to be raised by the Rural District Council of Neath in 1905 and 1908. The loans for water supply sanctioned to joint boards during the past ten years amount to £2,530,285, of which £745,643 stands for the year 1908. This includes £722,393 for the Metropolitan Water Board.

Most of the local inquiries held by the engineering staff of the Board are in connection with applications by local authorities for sanction to loans; but many other matters engage their attention. For example, they have to consider appeals against the apportionment of the cost of sewerage or water works between rural parishes, and objections to the construction of these works beyond the limits of the district for which they are required, and also to the construction of reservoirs which will hold more than 100,000 gallons of water. In connection with this work, 1181 inquiries were held during 1908. In addition, a large number of visits were paid with reference to complaints in regard to the sanitary conditions of towns and villages, and appeals by owners against the demands of local authorities for the repayment of the cost of making-up private streets, and the inspection of sewage-disposal and other sanitary works in respect of which the Board had sanctioned loans. Under section 243 of the Public Health Act, 1875, the Board are empowered to recommend the Public Works Loan Commissioners to advance moneys to local authorities for the purposes of that Act; but, by virtue of the Public Works Loans Act, 1898, their recommendation is no longer necessary in the case of such loans, unless the period within which a loan is proposed to be repaid exceeds thirty years. During the year 1908, the Board's District Auditors investigated the accounts of twenty special non-Metropolitan gas and water authorities; and the Board determined eight appeals against disallowances.

In pursuance of the Board's powers under the Public Health Act, 1875, they issued 21 Provisional Orders for the repeal, alteration, and amendment of Local Acts and Provisional Orders Confirmation Acts. Among them were the following: The Aspatria, Silloth, and District Order legalized works which had already been executed by the Water Board, and provided that certain other works to be executed should be carried out in accordance with plans to be approved by the Local Government Board. The Barry Order authorized the purchase by agreement of lands for protecting from pollution or contamination the sources of water. The Bethesda Order abolished the existing gas-rate, substituted the district fund and general district rate for the gas-rate as security for moneys borrowed for the purposes of the gas undertaking, made further provision for the repayment of such moneys, and empowered the Council to charge to the district fund any deficiency in the revenue of the undertaking. The Fulwood Order empowered the Board, on the application of the Council, to fix the rates and charges for a supply of water for domestic purposes, including additional charges for fixed baths and for each water-closet beyond the second in a house. In the foregoing and other cases, further powers were conferred on local authorities in regard to the gas and water undertakings, including the use of lands for the manufacture and storage of gas and residual products, the supply of gas, and of apparatus, &c., used in its consumption for lighting and heating or other purposes, the extension of the limits for the supply of gas, and other matters.

Among the financial, statistical, and other statements in the report is a table showing the loans sanctioned to county borough, town, and urban district councils in respect of their gas and water undertakings during the twelve months ended Dec. 31, 1908. The following were among the loans sanctioned for the first-named

purpose: Ammanford, £1000; Bangor, £2000; Barnoldswick, £2000; Brighouse, £6420; Burnley, £9500; Chorley, £10,317; Clacton, £5310; Congleton, £3000; Gainsborough, £2000; Glastonbury, £2271; Glyncorrwg, £1300; Hereford, £4160; Huthwaite, £1000; Ilkeston, £15,746; Leeds, £55,000; Liverpool in respect of the Fazakerley Gas Order, 1906, £21,006; Llandudno, £3880; Mansfield, £1100; Marple, £1000; Maryport, £1160; Milford Haven, £1914; Neath, £9925; Newark, £1400; Newbury, £1592; New Mills, £2000; Newland, £4000; Oswaldtwistle, £1955; Rhyl, £1100; Richmond (Yorks), £2000; Shipley, £6890; Sowerby Bridge, £1100; Stockport, £35,567; Stourbridge, £6000; Swadlincote, £4000; Teignmouth, £1000; Tipton, £1340; Tiverton, £4000; Torquay, £4150; Wallasey, £64,821; Wigan, £22,250. A number of loans were also granted in respect of water supply, the following being the principal ones: Bridlington, £11,000; Burnley, £5675; Colne, £2500; Coventry, £8306; Cowes, £6100; Croydon, £5000; Dawley, £14,000; Exeter, £9000; Harrogate, £3735; Hinckley, £14,000; Hyde, £11,000; Llandudno, £3350; Maesteg, £17,802; Portland, £4622; St. Ives (Cornwall), £11,205; Scunthorpe, £3200; Silsden, £3000; Wellingborough, £3800.

The section of the report dealing with local taxation and valuation sets forth that the Board prepared and presented to Parliament returns showing, for the financial year 1906-7, particulars of the receipts, expenditure, and outstanding loans of each county council, town council, urban district council, rural district council, and board of guardians, together with information as to the financial transactions and outstanding loans of all other local authorities exercising jurisdiction in England and Wales. According to these returns, the total amount of public rates collected in England and Wales during the year 1906-7 was £59,545,948; comprising £27,388,974 from poor rates, £13,652,749 from general rates in Metropolitan boroughs, £12,990,331 from general district rates, and £5,513,894 from other rates. The amount of public rates received for all purposes exceeded by £1,301,655 the corresponding amount for 1905-6; and £414,366, or 32 per cent., was due to additional rates received for the purposes of elementary education. From statistics given in one of the appendices, we find that the revenue of gas undertakings was £7,150,028; and from water-works, £4,615,664—against £7,073,249 and £4,429,778 in 1905-6. The expenditure of gas undertakings out ot loans was 424,749, and of water undertakings £2,771,799; compared with £523,394 and £3,178,722 before. The sums expended out of moneys other than loans were approximately £114,134,274. This total comprised the following sums: Maintenance and other expenses, gas-works, £5,066,646, water-works £1,742,579; loan charges, apportioned as far as practicable, gas-works £1,457,000, water-works (exclusive of the expenditure of the Metropolitan Water Board), £3,371,685—total gas, £6,523,646; water, £5,114,264. Further particulars as to the amounts expended otherwise than out of loans are given in an appendix to the report. The outstanding loans at the close of the year 1906-7 were: Gas-works, £23,550,765; water-works, £120,559,297, including £47,407,029 in respect of loans taken over or raised by the Metropolitan Water Board, whose work in the year 1908 is dealt with at some length by Mr. Charles Perrin, M.Inst.C.E., the Water Examiner under the Metropolis Water Act, 1871.

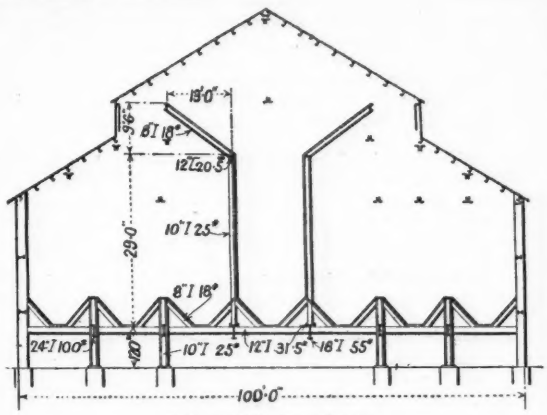
A STEEL-FRAMED COKE-STORE.

A RECENT number of "Engineering Record" contained the following particulars of a steel-framed coke-store designed for the Toronto Gas Company by their Engineer, Mr. W. H. Pearson, jun., and erected by the Dominion Bridge Company, of Lachine, Quebec.

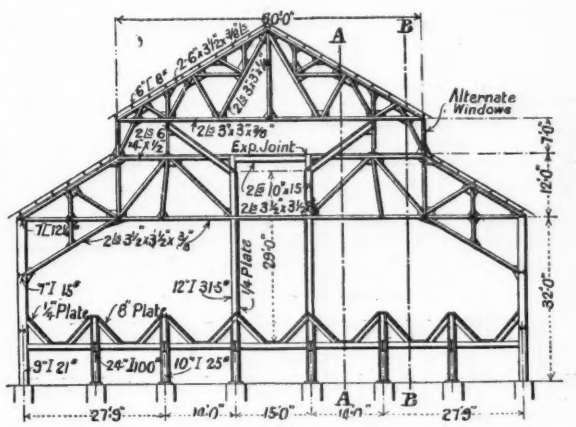
The building, 100 ft. by 170 ft., and 70 feet high, is constructed with steel framework, roof, and hoppers, and with brick walls; and its capacity is 147,000 bushels. It is divided, by two rows of tall intermediate columns, into three longitudinal aisles, each of which contains a full-length hopper-bottom bin supported on horizontal steel floor beams 12 feet above the surface of the ground. The centre bin is comparatively deep and narrow in cross section, with a wide flaring top, vertical sides, and inclined bottom, all covered with ¼-inch flat steel plates. The side bins are three times as wide as the centre one, and have vertical side walls, one of which is common with the centre bin, and the other is composed of a solid brick exterior wall 18 inches thick. The bin bottoms are divided into 36 cone-shaped sections, with one, three, and five bushel rotary measuring chambers, through which their contents can be delivered into cars on the surface of the ground.

The hot coke, which is not larger than 8 inches in any dimension, and weighs only 31 lbs. per cubic foot, is broken and delivered to gravity bucket conveyors supported by the roof trusses, and is automatically graded into the three sizes by rotary screens, and dumped into the bins, which are proportioned for maximum loads of about 260 lbs. per square foot at their floor area when filled to the tops of the side walls.

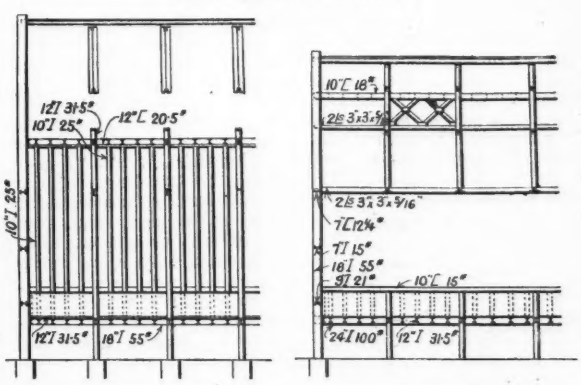
The framework has 13 longitudinal panels 13 ft. 9 in. long at the end, 9 ft. 8 in. long for the three centre panels, and eight intermediate panels of 14 feet. The transverse bents at the panel points are each made with four main vertical columns supporting the roof trusses and four short intermediate columns supporting the floors of the side bins. The centre main columns, 7 ft. 6 in. from the axis of the building, are 12-inch, the side wall columns 18-inch, and the intermediate short columns 10-inch I-beams, with their flanges reinforced (like those at the lower end of the centre column) with 9 in. by ⅜ in. cover-plates. The tops of the centre and wall columns are connected by simple side roof trusses of 41 ft. 9 in. span, with their top and bottom chords continuous between the centre columns, to provide transverse rigidity, but not designed for the transfer of vertical loads from one side of the building to the other.



Intermediate Cross Section.



Cross Section at Panel Points.



Longitudinal Section at AA. Longitudinal Section at BB.

General Structural Features of the Toronto New Coal Store.

The side trusses are knee-braced to the wall columns with long angle struts, and near the centre points of their top chords they carry very wide monitor frames, supporting the upper centre roof trusses of 60-feet span. Vertical and inclined members in the monitor bracing connect the upper and lower trusses, and provide for the support of the distributing conveyors and screens, &c., and of the flaring upper part of the centre bin. The roof trusses are connected longitudinally by 34 lines of 6-inch channel purlins, all covered with corrugated iron sheathing and by cross-bracing of single 3 in. by 3 in. angles in the horizontal planes of the bottom chords of both upper and lower trusses. They are also connected by one-panel and two-panel frames of vertical cross-bracing in the four panels, having bottom chord braces in three longitudinal lines of the upper trusses and in four longitudinal lines of the lower ones. The wall columns are built solid into buttresses formed in the brickwork of the sides and ends of the building, and are not braced.

The upper ends of the centre columns are framed to longitudinal 12-inch channels with horizontal webs and the flanges down. Similar channels connect the columns at the level of the bottom of the bin; and to both sets are framed the intermediate vertical 10-inch I-beams, about 3 feet apart, which support the wall plates. The bottoms of all the bins are of uniform construction and of unusual simplicity, made with a combination of I-beams, which avoid entirely the use of plate girders and special construction.

All the interior columns are connected with longitudinal 24-inch 100-lb. I-beams, 14 feet in the clear above the floor level, which support 12-inch horizontal transverse I-beams extending across the full width of the building in the planes of the 10-inch I-beams in the walls of the middle bin. These bins support directly the horizontal centre part of the bin floors, and also the inclined 8-inch I-beams in the sloping sides of the bin bottoms, which are framed at their upper end to 10-inch channels with horizontal webs and flanges down, which connect the upper ends of the short columns.

It is notable that the framework of the building is composed entirely of light riveted trusses of moderate dimensions and of the simplest type, angle-iron bracing, and columns, beams, and girders provided entirely by plain I-beam sections—thus securing great simplicity, minimizing shop work, and promoting rapidity of construction.

The building contains about 1,600,000 lbs. of structural steel, and was erected by an 80-feet 6-ton steel gin pole with steel guys. A derrick boom of 3 tons capacity was used for the lighter work, and assembled the trusses in position after they were completely riveted on the ground. On account of the steel plates in the bin floor, the work involved an unusually large number of field rivets, $\frac{3}{4}$-inch in diameter for the structural work, and $\frac{5}{8}$-inch for the bins, which were driven by pneumatic hammers operated by compresssd air. Drilling *in situ* was done by an electric drill of the same make, working at 220 volts.

The method employed to load the storage hoppers with coke is as follows: The inclined framework is one of two bucket conveyors that are fed with the broken coke from the retort-house conveyors. On reaching the highest point above the hoppers, the coke is delivered into one or more of the six rotary screens which, as already mentioned, grade the coke into three sizes. The deep and narrow hopper, running the entire centre length of the house, receives all the breeze; the hoppers on either side taking the various other grades. No tracks are provided inside the house; all the coke being delivered into carts and waggons and in bags. When necessary to load the coke into cars, a track is laid alongside the house, and the coke sent into cars through shoots in small openings above the windows of the side walls.

THE "PYROPHORIC" GAS-LIGHTERS.

Novelties in hand gas-lighters are introduced to us by Mr. Paul Metz, of 29, Newhall Hill, Birmingham. There have been several attempts to get away from the old electric devices, which were constantly failing; but it is only lately that there has been success. The line of attempted improvement has been to produce an alloy, passing a rough surface over which causes sparking. That is the fundamental feature of the new lighters which are introduced under the general title of the "Pyrophoric" gas-lighters. They are made in various sizes and lengths; but the two that are in our possession are the "Presto," which is $7\frac{1}{2}$ inches long, and the "Pyros," which is some 15 inches long. The latter is made in greater lengths for shop window lighting. The "Presto" lighter has a handle composed of a piece of bent steel so as to form a long V. At the end of one of the arms the carrier for the sparking alloy is riveted. The carrier is hollow at the upper part, down to about half its length. Into this hollow, a small piece of the alloy is dropped; and it is held in position by a spiral spring, which, in turn, is secured by a cap screwed on to the holder. A short rod, with its top cut in the form of a file, connects the two arms of the handle—working in a slot in the arm on one side and through a hole in the alloy carrier on the other. Sharp pressure of the two arms of the handle causes the file to rub against the alloy, and this produces the sparking. The "Pyros" lighter is made of a long hollow tube, inside which is carried a rod, with the file at one end. An inch or so from the end, the sparking alloy is contained in a little box, being pressed into position by a flat steel spring. The interior rod (also controlled by a spring) has on the end near the handle a projecting pin, extending through a slot beyond the outer tubular case. A short length of tube (controlled by a strong spring, and working on the main tube at the handle end) has at one end two projections for the fingers; and at the other there is a projection slotted to engage with the pin on the file rod. When so engaged, by pulling down the finger piece, the file rod is drawn along the tube, and, on being automatically released at the end of its travel, it causes a smart sparking at the end of the lighter. The lighters are interesting developments. We are informed that each pellet of alloy will give 5000 sparks; refills being supplied at a modest rate.

Yorkshire Junior Gas Association.—Next Saturday the members will pay a visit to the Frizinghall (Bradford) Chemical Works, of which the President, Mr. Stephen W. Shepherd, is Manager; and after the visit the President will read his Inaugural Address.

THE NEW RETORT-HOUSE AT THE ADDERLEY STREET (BIRMINGHAM) GAS-WORKS.

Reply of Mr. Barber to the Discussion on his Paper.

It will be remembered that at the December meeting of the Midland Junior Gas Engineering Association a paper was read on this subject, and gave rise to a long discussion—see "Journal" for Dec. 14, p. 747. A sad event (the death of his father) prevented the author, Mr. C. Carrington Barber, from being present to deal with the remarks of the various speakers; but he has now sent for publication the following reply to the discussion.

Before replying to the interesting discussion which took place on the occasion of the reading of my paper before the Association, I wish to take this opportunity of thanking the members for their kind expression and token of sympathy tendered to my mother and family during our recent bereavement.

The first important point raised in the discussion was the putting in of the foundation with lime concrete. I quite agree with Mr. Smart that cement concrete would have been the strongest; but since the foundations of one portion of the house had to be taken to the bottom of the old gasholder tank referred to in my paper, and, further, seeing that lime concrete was quite strong enough for our purpose, the cost of the foundations would have been increased unnecessarily by using portland cement.

With regard to the cost of the steel framed building, compared with a similar one built of solid brick, I can assure Mr. Smart that the matter was thoroughly gone into before the contract for the work was given out, and undoubtedly the best and cheapest form of building was adopted.

I regret that the drawing showing a section through the house is not correct in all the details. The drawing was made some time before the erection of the house was started on; and since then a number of minor alterations have been made—chief among them being the size of the coal breaker-pit and the dimensions of the hopper.

In getting out the ground for the building of the breaker-pit, no trouble was encountered with water; and it was not found necessary to render the walls with cement. I would like to point out the fallacy of the common practice of rendering the inside of breaker-pit walls with cement, to which Mr. Smart drew attention. If any cement is required to keep the pit dry, it should be put on the outside of the brickwork, not on the inside, so that the pressure of the water is taken by the brickwork, and not by the cement rendering.

The capacity of the coal-hoppers is 250 tons; and 200 tons of coal can be put up without much labour being expended on trimming. It is not necessary to work a night shift to fill the hoppers, since more than enough coal can be put up during the day to last through the night. The idea of having a big storage hopper is so that sufficient coal can be put up on Saturday to last over Sunday.

The slotted holes that were left in the ironwork for expansion have answered the purpose very well; and I was surprised to see that in Mr. Smart's experience he had found slotted holes did not take up expansion.

The gas-engine, which is 49 B.H.P., has given very little trouble; and it has not been found necessary to duplicate it.

The size of the retort-house governor was remarked upon by Mr. Johns. We work from about $3\frac{1}{2}$ in. to 4 in. pull on the outlet of the governor; and the whole make of gas is easily dealt with. It is not necessary to have two governors to allow of the cleaning of the one while the other is in action. They can be shut off and cleaned out at any time, simply by reducing the pull and opening the bye-pass, and thereby working the hydraulic main in the old way. Of course, it is generally understood that retort-house governors are worked on the foul main, and not on the hydraulic. This was evidently a printer's error.

The cost of carbonizing is roughly 10d. per ton; and, as I pointed out in my paper, this figure would be reduced very materially if the charging machine had its full complement of retorts to charge and discharge.

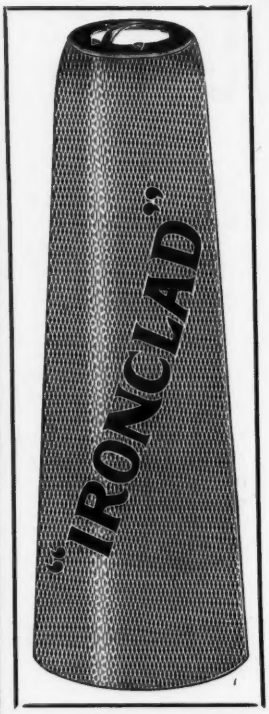
Messrs. Gibbons Bros., of Dudley, the Contractors for the building of the Adderley Street Gas-Works, guaranteed that with their setting there would be 10·5 cwt. of coke for sale, when carbonizing Holbrooke coal. The results of the tests are as follows:—

Yield of gas per ton of coal uncorrected for CO_2	= 12,130 cub. ft.
,, ,, ,, ,, corrected ,, ,,	= 11,957 ,,
Illuminating power corrected for CO_2 ("London" No. 1 argand, 17 distance)	= 16·68
Do., uncorrected for CO_2	= 15·85
Yield of coke for sale per ton of coal	= 10·97 cwt., containing 4 per cent. H_2O.

I thank the President and the members of the Association for the vote of thanks accorded to me for my paper.

The report of the University of Leeds for the year 1908-9 has lately been issued; and it furnishes an interesting review of the continued progress of the institution. In the course of references to new developments during the year, great satisfaction is expressed at the endowment of a Professorship of Fuel and Metallurgy by the subscription of £10,000 as a memorial to the late Sir George Livesey.

THE



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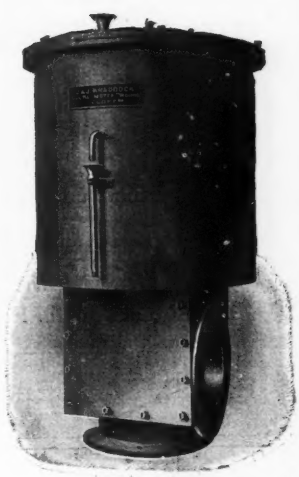

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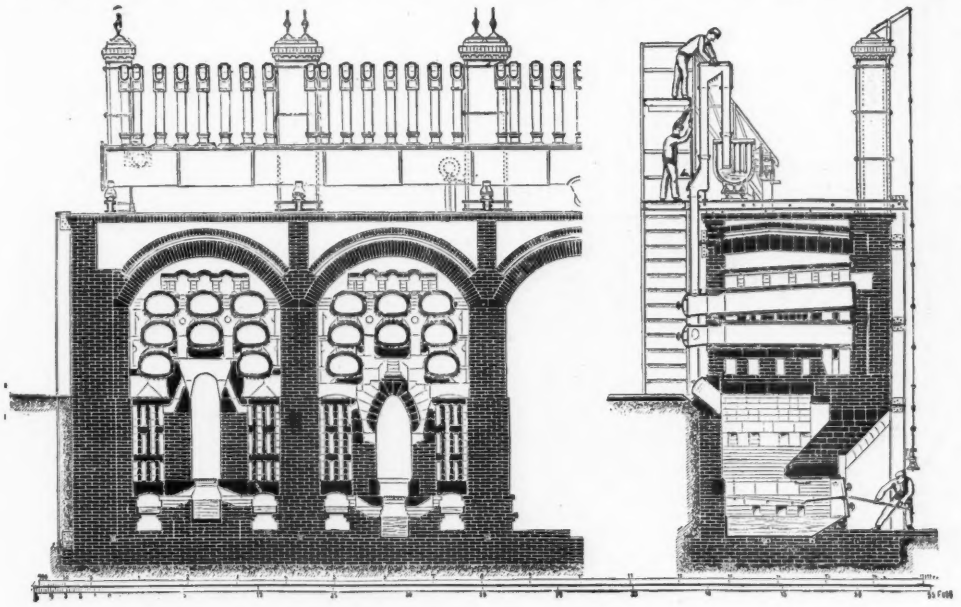
STRASBURG GAS-WORKS AND SUPPLY.

[Second Article.]

In the previous article (*ante*, p. 26), we gave a general account of the progress made by the Union des Gaz Company in the first half-century of their responsibility for the supply of gas in Strasburg. We now give a few particulars of the works and plant as they stand at the present time.

The situation of the works in the fortified portion of the centre of the northern quarter of the city gave rise to difficulties which called for some special solutions, having regard to the public health and to prefectorial requirements and the rules of the Syndical Association of German Gas-Works. The authority granted to the Company in 1897 to enlarge their works to a daily capacity of 2 million cubic feet was accompanied by the condition that the smoke from the retort-houses and the steam produced by the quenching of the coke should be carried away at a height of nearly 100 feet. The retort-house and boiler chimneys had therefore to be built about 145 feet high. The numerous stacks give the works a rather strange appearance, such as one would expect to meet with in a metallurgical or mining district. They, however, keep the neighbourhood fairly free from dust.

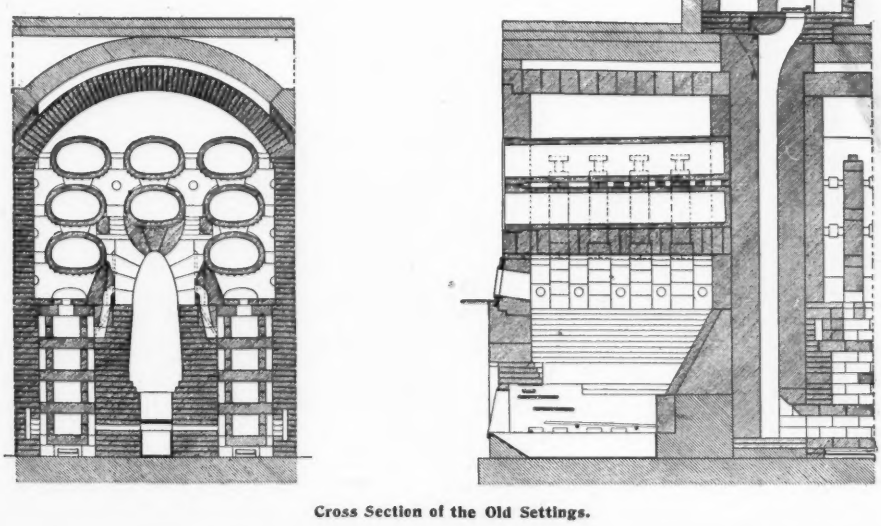
When, in 1908, the Company obtained sanction for the enlargement of the works so as to bring them up to a capacity of 3½ millions per day, they were required by the authorities to introduce some method of rapidly charging and drawing retorts; and various systems were considered. The retort-house intended to receive the new installation was already in existence, and contained a bench of horizontal retorts set back to back. It was therefore decided to retain this arrangement, and to introduce a machine which a journey to England had brought under notice,



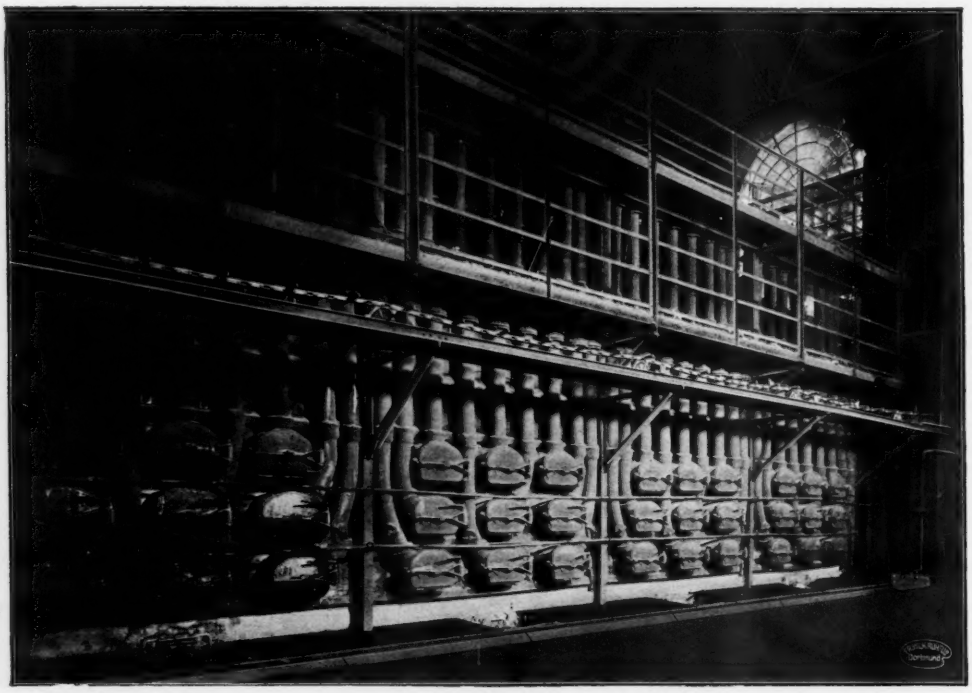
Cross Section of the First Recuperative Settings.

and which was considered to be superior to everything of the kind then upon the Continent. It was the Fiddes-Aldridge machine, of which a detailed description is given by the author of the book from which these particulars are taken (M. Gaston Kern). According to experience at Strasburg, thirty retorts, 21 feet long, each supplied with 8½ cwt. of coal, can be drawn and re-charged in 45 minutes. The accompanying illustrations show the old settings at the works, the first settings on the recuperative system, and the discharging side of the new retort-house. The machine serves a bench of thirteen double settings of nine 21-feet retorts, placed back to back. Each double furnace has only one generator, which is fed with the incandescent coke direct from the retorts, and consumes only 12 per cent. of the coal carbonized. The coke intended for sale falls into a chain conveyor on the Klönne system, by which it is carried out of the retort-house, where it is quenched and is then sent through a shoot into the coke-pit.

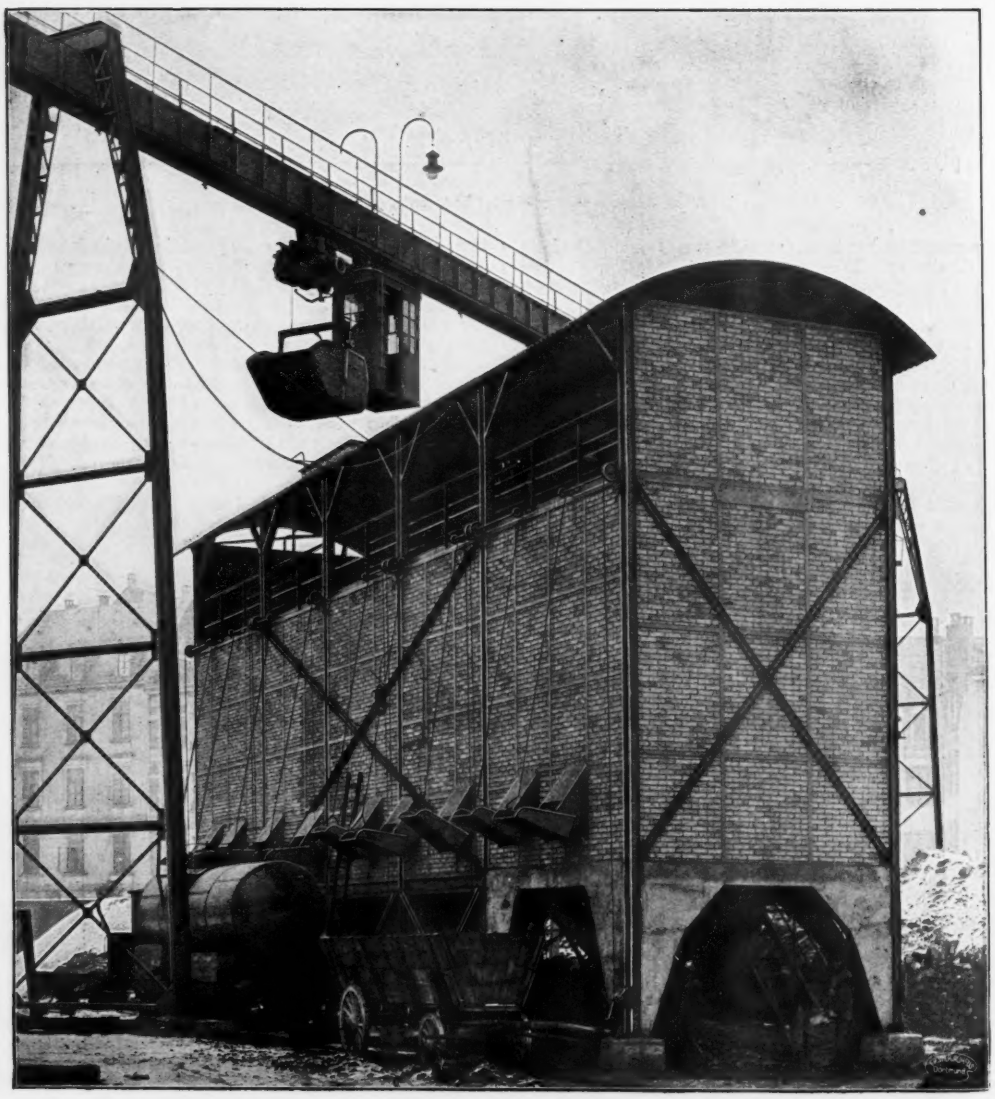
The transport of the coke to the stores is a new feature of the installation. The arrangement of the works is such that the coke has to be conveyed to the two yards by means of an overhead railway, located at a height of 55 feet, which connects them with the retort-houses. This portion of the plant is shown in the accompanying illustrations. The skip which receives the coke can convey it either to the shed from which it is sent away by cart, or to the railway shed by passing over the retort-houses. In this way the cart roads in the works are saved wear and tear, and the coke is moved with as little shaking as possible, assuming that the skip conveys it to its destination without any other manipulation. The coal is also dealt with by means of mechanical appliances. A horizontal conveyor, 82 feet in length, running



Cross Section of the Old Settings.



The New Retort-House—Discharging Side.



The Coke-Sorting Shed.

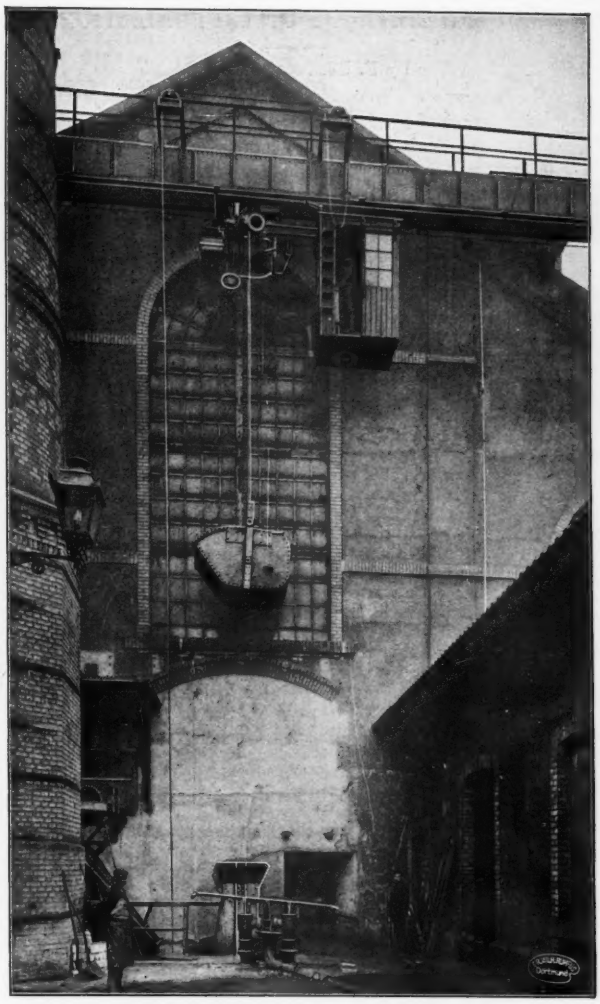
parallel to the railway lines, allows of the discharge and transport simultaneously of four trucks per hour. The coal is shovelled into the conveyor, which is worked by a three-phase electric motor hermetically closed so as to exclude dust. The coal-conveying plant, which will lift about 25 tons per hour, is sufficiently powerful to deal, in less than ten hours, with the whole of the coal required for a maximum day's production of gas in winter. Night work is consequently unnecessary. The consumption of electric current, at 125 volts, is 180 amperes per hour. The motive power required to convey a ton of coal from the truck to the store is about 1 kilowatt.

We pass now to the purifying plant, a conspicuous feature of which is a Klönne condensing tower of sheet iron, about 100 feet high and 13 feet in diameter, into which the gases of different compositions from the retort-settings pass at a comparatively high temperature. They enter at the bottom, rise slowly, mix with each other, and remain a long time in contact with the tar-fog that they contain. As the gases rise in the tower, they become cool by contact with the walls, and encounter the rain of condensation products, more especially the tar, which carries down a large quantity of the naphthalene in suspension. The efficiency of the apparatus is increased by means of a spray of weak ammoniacal liquor from the top, as well as by a series of perforated metal discs fixed at different heights inside the cylinder, so as to make the mixing as thorough as possible. The hot products of condensation, which leave the tower at the base, consist of ammoniacal liquor and tar, with a large proportion of naphthalene. The tar condensed in the Klönne apparatus is very fluid, and never causes obstructions. This condenser is not employed to the exclusion of other types of coolers, such as the Pelouze and Audouin and the "Standard;" on the contrary, their operations are facilitated by it. The arrangement of plant for the mechanical purification of the gas is shown below.

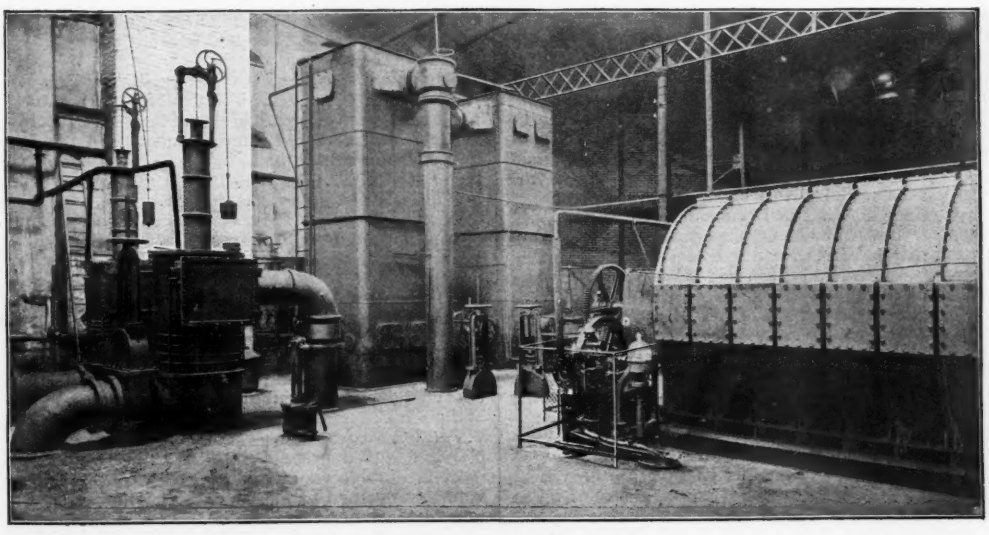
A certain amount of interest attaches to the chemical purification of the gas produced at Strasburg, in consequence of the efforts which have been made to reduce to a minimum the handling of the purifying material and its revivification in the boxes. Though the purifiers are located in a spacious shed enclosed in high walls, and situated about 500 feet from a dwelling-house, it may happen that when a box is opened, the odour arising is carried by certain winds into the neighbouring street. In order to minimize this trouble as far as possible, the number of purifiers has been doubled, the area of material trebled, and the latter rendered more efficient by the substitution of bog iron ore for sawdust. In this way it has been possible to effect the automatic revivification of the material in the boxes until it is quite spent. When in this condition, it is revivified generally in a well-ventilated building, where it is spread upon the ground in thin layers, so that a large surface may be exposed to the action of the oxygen in the air. A great improvement has been made of late years in the purifying plant by the introduction of the Klönne three-tray boxes. As in many other gas-works, the operation of purification is improved by the admission of a small quantity of air to the gas before it enters the purifiers. This, however, necessitates careful regulation of the temperature and of the degree of humidity in the boxes, owing to the over-heating that may arise there. The Klönne purifier is a practical application of the principle laid down by Herr Kunath, that the speed of gas when passing through the purifiers should not exceed 12 inches per minute with old Lux material, but may be three times this rate with new.

The next chapter in M. Gaston Kern's interesting book deals with the arrangements made to connect the works with the line of the Eastern of France Railway, and to move the coal-waggons from place to place. The extent of the traffic may be gathered from the following figures of arrival and departure: 3836 coal-trucks of 10 to 20 tons; 1966 coke-trucks of 10 to 15 tons; 54 coke tipping-waggons of 15 tons; 224 tank-waggons of 10 to 20 tons for tar; 36 do. for ammonia; 25 trucks for purifying materials; and 285 trucks for merchandise and materials for construction. In the course of 300 working days, there are about 20 loaded trucks and as many empty ones to manipulate in the ten-hour day. A few years ago, this required a squad of twenty men, and was attended by considerable danger. But there is in operation a system of mechanical traction which has rendered signal service since its installation.

It now only remains to give a few particulars as to the public lighting of Strasburg; and these are reserved for the concluding article.



The Overhead Railway for Transporting Coke.



General View of the Purifying Plant.

MODERN METHODS OF CARBONIZATION.

By E. Körting, of Berlin.

Reference was made in the report given in the "Journal" last week (p. 27) of an efficiency trial of a setting of eighteen vertical retorts at Mariendorf, to a communication to the "Journal für Gasbeleuchtung" on "Modern Methods of Carbonization," by Mr. E. Körting, the General Manager of the works of the Imperial Continental Gas Association in Berlin, to which communication the report in question formed an appendix. The following is an abstract translation of Mr. Körting's paper.

The dry distillation of coal constitutes the fundamental principle of gas manufacture; and, consequently, general attention has become riveted on types of settings and the various trials made and the experimental results obtained with them. The mass of material and data relating to the same is now so great that it is difficult to study it in detail and to give the different items their proper value. A well-known gas engineer recently expressed his views in the drastic statement that "there have never before in the gas industry been so many lies told as at the present time." To a certain extent, this expression of opinion may have some justification. It is in accordance with human nature that, for the sake of business interest or personal advantage, glowing statements should be made and failings suppressed. Hence it is eminently essential to sift thoroughly the value of all fresh information, whatever its source, and, if necessary, to revise our own position in regard to the matter in question. For instance, British gas engineers have told the author recently: "We have considerably increased our make of gas per ton of coal in horizontal retorts by charging them as full as possible, and we can now secure a make of gas of over 11,840 cubic feet per ton."

At first glance, this statement appears startling and almost inconceivable. To begin with, the figures are remarkably high; but it should not be forgotten that in England coal is not stored for a long time, as the surplus production of the summer is rapidly disposed of for export. Moreover, the distances in Great Britain are small; and the coal, consequently, is generally gasified while quite fresh. This accounts for much, as it is an established fact that many varieties of coal suffer great loss in their gas-making quality in the first few days and weeks after they are raised from the pit. On the other hand, the English coal which reaches Berlin has undergone a railway and sea journey, extending over at least 14 days, in the course of which it has been exposed in thin layers to all opportunities of weathering. Further, the whole of the winter requirements of English coal must be brought into store in Berlin in the summer. It may therefore be at once assumed that the make of gas in the gas-works of German ports which obtain fresh coal all the year round must be appreciably higher than that of inland works. The author's own information confirms this assumption. Still better results may therefore be expected in England.

How can the make of gas, however, be increased by charging the retorts full? We know that when small charges are put into quite hot retorts a portion of the heavy hydrocarbons and tarry vapours are decomposed, and, consequently, a considerably increased volume of gas is obtained. This is theoretically correct; but in practice it does not apply to many English coals. With small charges, the separation of the carbon occurs so energetically that the ascension pipes are constantly becoming blocked; and it is necessary, in order to facilitate working, to draw the coke before it is completely burnt off. Also it is much easier to distribute a large charge evenly in the retort than a small one; and, owing to the greater time required for working it off, the retorts are not opened so frequently. Finally, since the decomposition of the gas is to a great extent avoided when the retorts are filled, it is possible to work at higher temperatures.

All these points in conjunction afford an explanation for the seemingly paradoxical experience that large charges of English coal give a better make of gas per ton than small ones. Large charges worked off in six hours in the inclined retort settings at Berlin have, for similar reasons, given the same result—viz., the make of gas per ton has been increased. But, owing to the unfavourable condition of the coal, the make has only been about 11,480 cubic feet per ton. Much more gas, however—viz., 12,200 cubic feet per ton—is produced with small charges in horizontal retorts if an addition of Silesian coal is made to the English coal, so that high temperatures may be employed without the risk of much thick tar being formed. But there is a loss of ammonia, and the tar contains much free carbon and is less valuable, while the gas has a calorific power of only about 573 B.Th.U.; whereas the good gas from inclined retorts, of 584 to 595½ B.Th.U. per cubic foot, can receive a considerable addition of blue or simple water gas, while the ammonia and tar are preserved. We are thus also able (although only by the aid of water gas) to produce more gas per ton of coal in completely filled retorts. This fact is in complete agreement with the experiences obtained with the admission of steam in vertical retorts.

Speaking broadly, the dry distillation of coal only proceeds very smoothly when as many points as possible are offered at which the heat can act—that is to say, it proceeds best of all in vessels of minimum capacity and of maximum heating surface. The limits are determined by the friction on the fire-brick walls and the dependence thereon of the possibility of discharging the retorts, by the resistance offered to external influences by the cross section, and by the labour that is required for the service of the retorts. Vertical retorts are subject to a special limitation. In order to ensure the proper discharging of the coke, notwithstanding small inequalities in the surface of the retort, it is necessary that they should diminish in diameter upwards, and hence, with the Dessau retorts, for instance, the temperature of the setting must fall off from the bottom upwards in correspondence with the reduction in the cross section of the retorts. The author considers that continuous carbonization has its chief advantage in the fact that it is not subject to this last limitation, and that the heats in the upper parts of the settings can be as high as in the lower, or even higher. In this way a thin layer of coal is exposed to a high temperature, and favourable conditions of carbonization, which afford a high productive capacity per retort, are secured. The cross section of the upper part of the Woodall-Duckham retort shown in fig. 1 illustrates this statement. This form of retort, however, offers very small resistance to pressures in the direction of the arrows. It is clearly very difficult to give the requisite support to the retorts in the upper heating zone, as they must there be so far distant from one another that slabs inserted between them will sag. The author has therefore little confidence in the durability of the upper ends of these retorts. On the other hand, the Dessau setting, a cross section of the lower part of which is shown in fig. 2, is hottest where the cross-section of the retorts is strongest, and the props between adjacent retorts are the shortest and most solid. Hence the Dessau retorts have the greatest durability in the zone of highest heats; while the upper ends of the retort, being only exposed to the lower temperatures, can be made of less valuable material and yet possess a very long life.

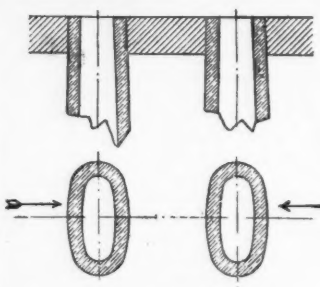


Fig. 1.—Woodall-Duckham Setting.
Upper Part.

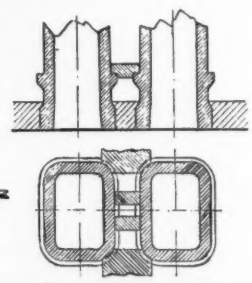


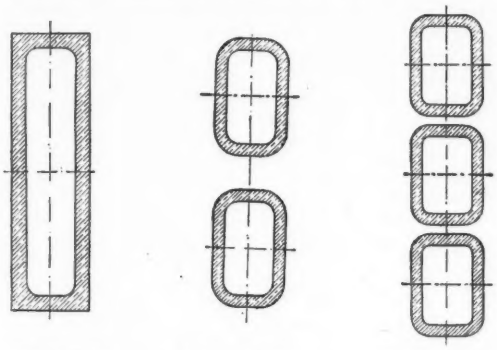
Fig. 2.—Dessau Vertical Retort-Setting.
Lower Part.

An important question is the comparative effect on the consumption of fuel in heating the settings of (1) a high temperature throughout the whole setting with a corresponding increase in the quantity of coal carbonized in a given time, as accomplished in the continuous systems of carbonization, and of (2) the great falling off of heat from the bottom to the top of the Dessau retorts, which implies a good utilization of the heat in the setting itself. The results of the Glover-West retorts appear to be good in this respect; but they are surpassed by the latest form of the Dessau retort-setting. An advantage of continuous carbonization is the complete absence of smoke; but it presents the following disadvantages: (1) Separate charging and discharging mechanism is required for each retort. (2) The continuous movement of the whole contents of the retort cannot possibly be advantageous to the coke. The econony of the system would be thoroughly dubious if the reduced durability of the coke increased the quantity of coke breeze by only a small percentage of the weight of coal carbonized. (3) It is impossible to inspect the inside of the retorts because they are always quite full, and to ascertain whether they need repair and whether the coal is properly disposed to them.

The patent specification of Messrs. Robert Dempster and Sons, Limited [see "Journal," Vol. CVIII., p. 411, cf. also pp. 27 and 125, and pp. 179 and 326], is also of interest. Its object is to heat vertical retorts worked intermittently, as in the Dessau system, uniformly throughout their whole length, but without any extremely high temperature. To judge from the drawing, the retorts narrow but little, if at all, towards the top. The patentees would thus utilize the whole heating surface as far as possible, as in the case of continuously worked retorts. But it is to be feared, according to our experience, that vertical retorts will not work properly unless they are considerably tapered towards the top, as quite small inequalities interfere with the discharge of the coke. If, however, the tapering is necessary, it is impossible to avoid, with intermittent working, heating in the same way as with the Dessau settings. In that case, experience shows that, as soon as the heat in the upper part of the retort is greater than corresponds to the coal contained in that part, superheating of the gas takes place, and pitch and naphthalene are formed.

The large carbonizing chambers or ovens so far produced are clearly designed primarily not with the object of providing the most favourable conditions for carbonization, but rather with a view to reducing to a minimum the labour required by the adoption of the largest possible charges and the longest periods of working-off the charge. If the conditions of carbonization—*i.e.*, the ratio of the capacity of the chamber to its heating surface—

are not favourable, it follows that the consumption of refractory material and of fuel will be disproportionately high. One point in favour of large chambers or ovens as compared with Dessau vertical retorts is that the chambers are at nearly the same uniformly high heats throughout their length. Inclined retorts and through horizontal retorts have likewise the same advantage. The author is therefore of opinion that the latter—especially when worked with nearly full charges, as in a setting experimentally tried at the Dessau Gas-Works, or as in the Glover half-chambers, 3 feet deep [see "JOURNAL," Vol. CVI p. 701] at Norwich (fig. 6),



Large Chamber Retort.	Setting of Twelve Retorts.	Setting of Eighteen Ketorts.
207·75 sq. ft.	106·56 sq. ft. Heating surface per retort.	99·67 sq. ft.
3968·3 lbs.	1322·8 lbs. Weight of charge per retort.	1102·3 lbs.
117 sq. ft.	180·4 sq. ft. Heating surface per ton of coal.	202·3 sq. ft.

Fig. 3.

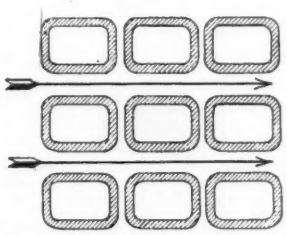


Fig. 4.—Half of a Vertical Retort-Setting seen from Below.

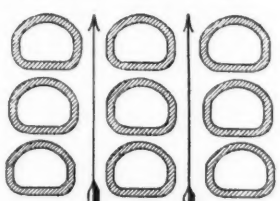


Fig. 5.—Vertical Section of a Horizontal Retort-Setting with Producer Firing.

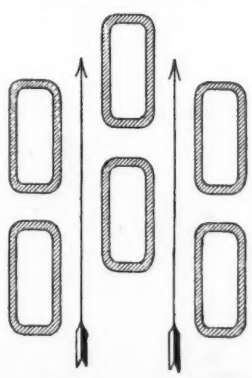


Fig. 6.—Vertical Section of a Setting of Glover Horizontals.

or, to a less extent, in all modern through horizontals with push stoking machinery—are, from the heating standpoint, technically superior to the large carbonizing chambers in which the charge is worked off in twenty-four hours. The economy of wages by means of further improvements is scarcely worth consideration at the present day. On the other hand, the fuel consumption clearly is very important. The wages at Berlin rates amount at the present time to about 0·3d. per 1000 cubic feet, whereas the fuel consumption in heating the settings entails a cost of about 3d. per 1000 cubic feet. Hence it will be seen that a reduction of 10 per cent. in the fuel consumed amounts to as much as the whole expenditure on wages.

The author does not understand the need for large carbonizing units which has suddenly arisen, or been artificially promoted, in Germany. Large units cost small gas-works more, both in capital expenditure and in working charges. In order to put a large unit out of action, the reserve must be correspondingly greater than with small units. The consumption of fuel and loss through irregular working render smaller units far better adapted for actual requirements. It is of no avail to have one small setting of the earlier type to be put in and out of working, while the installation consists chiefly of a number of large units. Ordinarily, a single setting works in very unfavourable conditions, and probably will not be kept at a sufficiently high heat. The best plan is to have alongside the large units a couple of smaller units of the same system—as, for instance, to have alongside settings of twelve vertical retorts one of six and one of four retorts. The working conditions are still more unfavourable for small works if, in addition to large settings, the retorts or chambers are also large. There is then the greatest difficulty in producing uniform gas, and great inconvenience is thereby caused to the consumers and indirectly to the works itself.

It must, however, be recognized that large units present some advantages for quite large works. In certain conditions they are so much cheaper in installation and in working per 1000 cubic feet of gas made, that, notwithstanding the faults indicated above, they may even be advantageous for gas-works of moderate size. Having regard to all these circumstances, the following settings are recommended for the Dessau vertical retort system—viz., for productive capacities of 130,610 to 148,260 cubic feet (? per diem), settings of ten retorts 4 metres (13 ft. 1½ in.) in length; and for productive capacities of 176,500 to 201,210 cubic feet, settings of twelve retorts 5 metres (16 ft. 5 in.) in length. According to the fashion of the day, experiments were made with retorts of large size at the Dessau and the Mariendorf Gas-Works. Two retorts placed one behind the other were united so as to form one large chamber; while no appreciable change was made in the width or heating of the retorts. The result was entirely unsatisfactory. The durability of the chambers was lower than that of the retorts. The time required for carbonization was increased very considerably, as well as the consumption of fuel; so that the chamber system proved thoroughly uneconomical. This result might have been foreseen from the proportion of the weight of the charge to the heating surface. The result was instructive, as it suggested an attempt to work in the opposite direction, and to increase the heating surface relatively to the weight of the charge.

This question was tackled in a very simple manner by arranging three rows of retorts behind one another, in place of two, and somewhat curtailing the cross section of the retorts by shortening their longer axis. The development from the large chamber retort to the three retorts is shown in fig. 3. It will be seen therefrom that the heating surface of the chamber is much smaller than that of the two retorts, whereas that of the three retorts is considerably greater than that of the two. At the same time, the shape of the retort is improved, as the heat from the narrower sides of the retorts can supplement to a considerable extent that from the wider sides. Thus 1½ tons of coal is much more favourably disposed in the three retorts, and affords much greater accessibility to the heat than the 1·2 tons of coal which constitutes the total charge with the two retorts. It is instructive to compare a horizontal section of the new setting with a vertical section of a setting of nine horizontal retorts and one of six Glover half-chamber retorts. These sections are shown in figs. 4 to 6. It will be seen that the vertical settings nearly revert as to the form and arrangement of the retorts, to the old producer fired setting of nines. "*On revient toujours à son premier amour.*" But there is a difference in that the space is better utilized through the heating gases playing on the long sides of the retort and not on their narrow sides. The Norwich settings, on the other hand, appear to present a happy compromise between chamber and retort settings. The retorts are much more suitable so far as sagging is concerned than the old horizontal retorts. They expose their long walls fully to the heat, while their width is sufficient for the time of working off to be extended to twelve hours. In comparison with ordinary horizontal retorts, they introduce both economy in working and advantages as to make of gas and fuel consumption.

Reverting, after this digression, to the new Dessau settings of 18 retorts, it should be observed that this number is placed in a setting of the same external dimensions as the former setting of 12 retorts; so that there is an increase of 25 per cent. in the coal charged into the retorts of the setting, while the radiating surface of the latter remains unchanged. It is thus obvious that if the heating of the retorts presents no difficulties, the efficiency of the setting must be considerably improved. The working results obtained with the new setting in the trial which was made of it by the Instructional and Experimental Gas-Works of the German Association of Gas and Water Engineers [of which a report was given in last week's "JOURNAL"], show that the heating of the setting was quite satisfactory. The output of gas per setting of retorts is now amply sufficient for the requirements of quite large gas-works. The increased output has been attained without making any change in the disposition of the producer and recuperator, or in the position of the De Brouwer conveyor.

Since the retort-house and the area which it covers remain also unaltered, there is an economy effected in the capital expen-

diture of 25 per cent. Incidentally it may be pointed out that it has been found possible to make the iron construction of the "Oberspree" type of retort-house more than 30 per cent. lighter. The fuel consumption with admission of steam to the retorts is now the same as that of the best producer settings. The high make of gas per ton of coal is thus secured free of cost. If there is a saving in the fuel consumption of 3 per cent. of the weight of the coal carbonized, there is an economy per setting per annum of about 219 metric tons of coke, which, at £1 per ton, represents a saving of £219, which, capitalized at 4 per cent., is equivalent to a capital value of £5475. This, however, is not the only improvement in the conditions of carbonization. The second problem attacked was the diminution of labour. This was simply and appropriately solved by regarding three retorts as one and working them together. The three bottom doors of the retorts are mounted on a common axle shaft; so that they are opened together and the whole contents of the three retorts are discharged at once. The three doors are then closed again by a single handle; and the three retorts receive their charge of coke and of coal at the same time. The labour saved is as 6 : 15. Assuming that ten beds of 18 retorts can be attended to by two men, it follows that four men will, in 24 hours, suffice for an output of 65,000 to 75,000 cubic metres (2,294,500 to 2,647,500 cubic feet), or that the make of gas per man will be 16,000 to 19,000 cubic metres (564,800 to 670,700 cubic feet).

The upper mouthpieces of the retorts are connected together, so that they require only one short pipe for taking off the gas. Thus the new construction, in addition to saving labour, has the advantage of considerably greater simplicity. It is interesting also to note in the last annual report of the Cologne gas undertaking that the vertical retort gas required the use of only half as much purifying material as the gas from inclined retorts. Thus, in addition to the reduction in the amount of sulphur in the purified gas, which has been well known for a long time, there is also the prospect of smaller purifiers being required, and of a saving in purifying material and wages. A third great advantage is that no appreciable formation of pitch or thick tar occurs in the take-off or the dip pipes. The horizontal take-off pipes are cleared only once in eight days, and the pans beneath the dip-pipes only once in four to six weeks.

The construction of the new type of Dessau vertical retorts can also be applied substantially to smaller settings; and experiments in this direction are well advanced. It will therefore be seen that the constructors of the Dessau vertical retort settings are remaining true to the principles which have gained for them the confidence of many gas undertakings. Careful practical trials had shown the vitality of one set of ideas and the impracticability of others which were tried in good faith. Thus, slowly and step by step, having regard also to the experience gained, improvements have been introduced in many directions. Any other course of procedure is precluded, as the first attempt throughout has rarely or never had any good result. In the present transition stage from one type of setting to another, there is naturally considerable trouble in making a proper choice.

The communication concludes with a reprint of the report of the Instructional and Experimental Gas-Works at Carlsruhe, on the efficiency trials carried out by it at the Mariendorf Gas-Works upon the new setting of eighteen vertical retorts. This is the report of which a summary was given in the "JOURNAL" last week (p. 27).

PROFESSOR DIXON ON FLAME.

At the Royal Society of Arts last Wednesday afternoon, Professor Harold B. Dixon, M.A., F.R.S., delivered his first lecture to a juvenile audience, on "The Chemistry of Flame." We learn from the Society's "Journal" that the lecture was devoted to an account of the researches of the early chemists, from Boyle to Cavendish, on whose work is founded the knowledge that we now possess of the composition of the air and the nature of combustion. A number of the experiments of the early investigators were repeated, and the means were shown by which Boyle proved that air has weight and that metal gains instead of loses weight when burnt, by which Priestley separated what he called "dephlogisticated air," and we call "oxygen," and by which Scheele showed, without knowing it, that hydrogen, when burnt in a closed vessel, removes the oxygen from the air.

What we knew about the chemistry of flame was, he said, due to the work of a number of men, chief of whom were some of our own countrymen, who made experiments, beginning some 250 years ago. Up to this time, fire had been regarded as being an "element;" and indeed for long afterwards many people thought there was an element or principle of fire. The experiments of Boyle, Hooke, and Mayow first showed that a body when burning uses up part of the air; and they gave this air the name "nitre air," because it was also found to be in nitre. Hooke and Mayow proved the true nature of flame, and also showed that the breathing of animals was of the same nature as combustion. But these great discoveries were forgotten; and it was only after the discovery of oxygen by Priestley and by Scheele, and the discovery of hydrogen and the compound nature of water by Cavendish, that Lavoisier was able to put forward the modern theory of combustion.

MODERN DEVELOPMENT OF THE GAS INDUSTRY

In the "JOURNAL" for the 26th of October last, we gave an abstract of a paper on the above-named subject read by Dr. W. B. DAVIDSON, F.I.C., the Chief Chemist of the Birmingham Corporation Gas Department, before the Birmingham Section of the Society of Chemical Industry. The full text of the paper appears in the current number of the Society's "Journal," and we extract therefrom the portions to which only passing reference was made on the previous occasion.

In the introductory portion of the paper, the author gives a table showing that about 16 million tons of coal, valued at £10,000,000, and 60 million gallons of oil, valued at £700,000, are used annually in the production of gas, coke, and residuals in the gas-works of the United Kingdom; the make of gas being about 190,000 million cubic feet, of which approximately 11 per cent. is carburetted water gas. He then goes on to show that on the Continent, the magnitude of the gas industry, relative to the population, is much smaller than it is in this country. The total quantity of coal carbonized for gas in Germany is only 5½ million tons per annum, 25 per cent. of which comes from England. Coal in Germany costs on an average about 20s. a ton; while coke is sold at 25s. a ton. In the United States, carburetted water gas bulks more largely in the public supply than coal gas.

During the eighties and nineties, the rate of increase in the output of gas in this country was seven or eight times the rate of increase in population. Dr. Davidson points out that naturally this extraordinary development could not be maintained for very many years; and so it is not surprising that the last decade has witnessed a considerable slackening in the demand for town gas. He shows this by the following table compiled by him from "Field's Analysis," giving the outputs for 24 of the largest gas undertakings in the United Kingdom for the years 1888, 1898, and 1908, together with the decennial percentage increments for the two intervals in question:

Name.	Millions of Cubic Feet.			Decennial Percentage Increase.	
	1888.	1898.	1908.	1888-1898.	1898-1908.
Gaslight and Coke Company.	18,610	22,400	23,740	20·4	6·0
South Metropolitan Company	5,890	9,825	12,790	66·8	30·2
Birmingham Corporation . .	3,722	5,531	7,328	48·6	32·5
Glasgow Corporation . . .	2,705	5,355	7,034	98·0	31·3
Manchester Corporation . .	3,046	4,158	5,779	36·5	39·0
Commercial Company. . .	1,989	2,614	3,369	31·4	28·9
Sheffield Company. . . .	1,649	2,424	3,474	47·0	43 3
Newcastle-on-Tyne Company	1,668	2,519	3,350	51·0	33·0
Brentford Company . . .	1,031	1,658	2,866	60·8	72·9
Bristol Company	1,348	1,798	2,684	33·4	49·2
Nottingham Corporation . .	1,405	1,697	2,109	20·8	24·2
Leicester Corporation . . .	900	1,451	2,062	61·2	42·1
West Ham Company . . .	579	1,009	1,903	74·2	88·6
Salford Corporation . . .	843	1,346	1,716	59·7	27·5
Dublin Corporation . . .	1,233	1,447	1,555	17·4	7·5
Tottenham Company . . .	279	525	1,495	87·5	185·9
Oldham Corporation . . .	810	1,094	1,471	35·0	34·5
South Suburban Company .	747	1,121	1,293	50·0	15·3
Portsea Company	565	764	1,384	35·2	81·2
Croydon Company	389	673	1,293	73·0	92·1
Brighton Company. . . .	821	1,027	1,261	25·1	22·8
Wandsworth Company . .	311	631	1,105	102·9	75·1
Plymouth Company . . .	508	836	1,096	64·6	31·1
Bolton Corporation. . . .	629	885	1,022	40 7	15·5
Totals. . . .	51,677	72,786	93,179	40·8 average	28·0 average

The author directs attention to the fact that the Metropolitan Companies are making less rapid progress than the Provincial undertakings; while the London Suburban Companies show an abnormally high rate of increase. This, he says, is only what might have been expected. He adds that it is gratifying from the manufacturers' point of view that, in spite of economies in the consumption of gas for lighting purposes, the ever-growing competition of electricity for the supply of light and power, and the introduction of producer-gas plants in large factories, the average rate of increase in the output of gas is still more than double the rate of increase of the population. Analyzing the figures for individual years, it is found that the weather is the most important factor to be considered as affecting gas consumption. In particular, the presence or absence of fog has a marked effect. Now that a very considerable proportion of town gas is used for industrial purposes, a reflection of the state of trade is found in the annual records of gas-works.

Passing the next sections of the paper, which have already been noticed, we come to the author's remarks on the progress made in the production of residuals and in methods of purification. These we give in full.

RESIDUALS.

Coke, Breeze, and Dust.—The sale of coke has been encouraged by paying strict attention to the sizing. It is now the usual practice to screen the coke so as to produce large and small coke, 1-inch breeze, breeze, pea breeze, and dust, to suit the require-

ments of different classes of customers. There is a steady sale of considerable quantities of "small coke" for household use. Coke-dust, formerly sent to the tip, is now sold for use in boiler furnaces where there are special fire-bars and forced draught. At some works, particularly in Germany, coke dust is mixed with tar and converted into briquettes, which find a ready sale. In 1907, patents were taken out for the manufacture of what was described as a new smokeless fuel called "Coalite." The material is now produced on a fairly large scale by the British Coalite Company at Wednesfield and at Plymouth. This fuel is the product of coal carbonized at a temperature of 1000° Fahr. as against 1800° Fahr. for ordinary gas coke. In the process of manufacture, the gas made per ton of coal is only about 5000 cubic feet; half of the total volatile matter of the coal remaining in the coke. The tar obtained is about 20 gallons. It is of a light nature and particularly rich in paraffins. The yield of ammonia is 70 per cent. of that produced at high temperature. Coalite ignites more readily than ordinary gas coke, and burns with more flame; but it is only slightly better in heating efficiency. In view of its greater efficiency and smokelessness, as compared with coal, coke merits a much larger sale for household purposes than it at present enjoys.

Ammoniacal Liquor.—There is little to be said regarding this residual. Synthetic nitrogenous manures, such as nitrolime, have hitherto failed to prejudicially affect the sale of ammonium sulphate. A considerable quantity of gas liquor is now converted into strong ammonia, both in this country and on the Continent. This is found to be much more remunerative at present prices. Quite a large number of gas-works possess sulphate plant, which in its improved modern construction is easily controlled. The extraction of ammonia from the crude coal gas, in these days of perfected mechanical appliances, is very complete. In the final washing with a rotary washer of up-to-date construction, one may confidently expect an efficiency of 99 per cent.

Tar.—Since the discovery and development of the aniline dyes, coal tar has had an attraction for the young research chemist. The unfortunate fact remains that thirty years ago tar fetched nearly double the price that it does to-day. The cause of the fall in price is the usual one—the supply is greater than the demand. Quotations depend largely on the market for pitch. As a dressing for roads, a new use has been found for gas-works tar. It is said to preserve the surface of the road from disintegration, and thus suppress the dust nuisance. Its use is accompanied by diminution in the expenditure on road cleansing, on watering, and on maintenance. Carburetted water-gas tar is of slightly less value than coal tar. Special use has been found for it in the manufacture of naphthalene solvent. It yields a good kind of pitch, which finds a use in the manufacture of special varnishes.

Spent Oxide.—One of the troubles in purifying gas by means of oxide of iron has been back-pressure, caused by the oxide settling down in a compact mass, and thus offering excessive resistance to the passage of the stream. This has been remedied in a large measure by alterations in the design of the grids supporting the material. Various kinds of oxide ore are employed; but they are being displaced to quite a large extent by artificial oxide prepared from the burnt spent oxide. This material is inactive towards sulphuretted hydrogen immediately after coming from the kilns; but after exposure to the action of air and water for a prolonged period, and after treatment with a little lime and copperas, it is able to do its work satisfactorily, especially when lightened by the addition of sawdust or similar material. Nearly all the spent oxide of the gas-works is used for the manufacture of sulphuric acid. A small proportion is bought by a few chemical works for the extraction of prussian blue and sulphocyanide. This is said to be a profitable business only when the oxide contains at least 5 per cent. of the former ingredient. Lime for purification has been largely discarded, especially in the South of England.

Cyanogen Extraction.—Ten or twelve years ago, and occasionally since then, prussiate of soda crystals were quoted at 4½d. and 5d. per pound. The price has been dwindling for some time, and during the present year [1909] it has stood at 3d. At the former figure, a handsome profit could be made if the plant was sufficiently large to treat at least 2 million cubic feet of crude gas per day. At the present time, few are bold enough to erect expensive appliances for the sake of cyanogen recovery. In the absence of a recovery plant, the impurity (only 0·2 per cent. by volume of hydrocyanic acid) is removed to the extent of about 80 per cent. by the oxide through which it has to pass. Prussiate processes, on the Foulis, Davis-Neill, or similar systems, are now operated at seven or eight gas-works in England.

A description of the various processes would carry us too far. Suffice it to say that ferrous hydrate, sulphide, or carbonate mud is the essential ingredient; the base being ammonia, soda, or lime, or a combination of these. One of the great difficulties experienced has been to find a suitable washer to deal with a heavy sludge. The Holmes brush rotary washer is employed with success when the mud is thin; but troubles ensue when the sludge is inclined to be gritty or thick. The highly ingenious washer patented by Feld in 1906, though not so high in efficiency as one would like, gets over this difficulty very satisfactorily.

It is more profitable to treat the gas before removing the ammonia. On the Continent, the Bueb prussiate process is very generally employed in the larger works. The method consists simply in running a strong solution of copperas from time to time into a rotary washer. The sludge containing soluble and insoluble prussiate is sold to chemical works.

The British Cyanides Company's patented process of extraction has been in operation at a number of moderate-sized works for some years. In this process sulphur is added to strong ammoniacal liquor in a suitable washer to form polysulphide, which takes up the hydrocyanic acid to give sulphocyanide. The resultant product is sold in the form of liquor to the chemical works.

Developments in Purification.

Carbon Bisulphide.—Under the old restrictions of the sulphur clauses, lime had to be employed on a large scale. This was sulphided so as to remove the carbon bisulphide as thiocarbonate. At the same time a large proportion of the carbon dioxide present was eliminated. With the repeal of the clauses, the use of lime became no longer necessary, except where no better means could be found of maintaining the illuminating power of the gas. It is possible to gain one candle by removing all the carbon dioxide; but, all things considered, it has generally been found unprofitable to do so. When the sulphur clauses were enacted, the incandescent burner was not known. The diminution in the consumption of gas for a given candle power with the incandescent burner was thought to be good cause for the removal of the sulphur restrictions. Nevertheless, the elimination of organic sulphur, as it is called, would be a welcome gain to the gas industry; for there is no gainsaying that the formation of even minute quantities of sulphuric acid in a room cannot but be harmful to furniture as it is to metallic fittings.

It is not likely that lime purification will again be resorted to, on account of its tediousness, high cost, uncertainty, and the difficulty of removing the malodorous product. Some hope of success is held out by the large-scale experiments of Mr. Hall, of Portland, Oregon, the results of which have been recently published. Mr. Hall has adopted the expedient recommended by Mr. Vernon Harcourt fifty years ago, of simply heating the gas, leaving the purifiers to a temperature of 700° to 900° C. The probable reaction that occurs is represented by the equation $CS_2 + 2H_2O = 2H_2S + CO_2$. The heating takes place in brick chambers, and the gas is afterwards purified a second time with iron oxide. The great bulk of the organic sulphur is said to be removed in this way; but nothing is known as to costs.

Liquid Purification.—Seeing that a purifier-box must be opened more or less frequently, with attendant dangers of firing of the oxide by rapid revivification, the loss of gas, and the subsequent admixture of a large quantity of air when the box is again put to work, a process of liquid purification in closed vessels has been much sought after by gas manufacturers. Partially successful attempts to solve the problem were made in the eighties by Hills, Claus, and Holgate. The processes then experimented with depended on the action of purified ammonia, obtained by the distillation of the gas liquor, in absorbing hydrogen sulphide and carbon dioxide. The experimental plants that were erected were discarded one by one. Their failure was due to the following causes: (1) The loss of ammonia; (2) the incompleteness of the reactions; and (3) the costly nature of the plant and the supervision necessary.

Two or three years ago, Dr. Feld launched a scheme for condensing and purifying coal or coke-oven gas. The gas was to be taken as hot as possible—say, at 200° C.—from the retorts, and treated in a series of centrifugal washers. The tar was to be fractionated (by hot washing) into pitch, dry heavy tar, and dry light tar. It was intended to extract ammonia in two washers and sulphuretted hydrogen in another set of two. One washer was to be used as a cooler. Thus it was proposed to perform the whole process of condensation and purification in a small building under the supervision of one man. Attempts have since been made to work the process in Germany; but, so far as I can gather, without complete success. There have been naphthalene and other troubles. The idea is brilliant, and, I think, it is well worthy of a sustained effort to put into execution.

[The author described the Feld process as in use at the East Hull Gas-Works, and the later proposal of Herr Feld to ensure the complete extraction of ammonia to form sulphate simultaneously with the removal of sulphuretted hydrogen.]

The paper concludes with some references to the new appliances which have been introduced in connection with the manufacture of gas.

The Mineral and Chemical Industries.—At the meeting of the London Section of the Society of Chemical Industry on Monday last week, a paper on "The Relation between the Mineral and Chemical Industries" was submitted by Mr. G. T. Holloway. In the course of it, the author remarked that the evidence deduced from the association of minerals in Nature was shown to be of the greatest value, not only to the prospector, but also to the chemist and metallurgist. The manner in which the demand had created a supply, even in the case of rare metals, was well brought out in relation to the exploitation of monazite sand and the production of tantalum. The thoria obtained in the monazite industry and employed in the annual production of more than 200 million incandescent mantles amounted to only about 5 per cent. of the total amount of rare earths thus handled; and the ceria, zirconia, didymia, and other oxides which were thus accumulated as by-products furnished an important field for the researches of the industrial chemist.

MIDLAND JUNIOR GAS ASSOCIATION.

Visit to Messrs. Hardman's Tar Works.

There was a large muster of members of the Midland Junior Gas Engineering Association on Saturday afternoon, to take part in a visit which had, by permission of the Directors, been arranged to the Nechells tar works belonging to Messrs. Josiah Hardman, Limited.

The headquarters of the firm are, of course, at Milton, near Stoke; the Nechells works having been put up only a few years ago, on the securing of the Birmingham Corporation tar contract—although tar from other places is also dealt with there. The quantity of tar being treated at the Nechells branch is about 6½ million gallons a year; but the plant is of sufficient capacity to accommodate another 2 million gallons, or so. The works are connected with both the Saltley and Nechells Gas-Works of the Birmingham Corporation by a 9-inch main having two 6-inch branches. At the Saltley works, there is a special pump for the purpose of boosting the tar along, as the main has to pass over two bridges. From the Nechells gas-works the main is on the level. On one side of Messrs. Hardman's works there is a canal, and on the other the railway; so that there is ample facility for tar from other places than Saltley and Nechells being brought in by boat and railway tank-waggons. On arrival, the tar is pumped into storage tanks by a large Evans pump.

When the members of the Association assembled at the gate of the works, they were received by Messrs. Hardman's Manager (Mr. Warnes), who escorted them round, and fully explained everything of interest. In acting the part of guide, he was, it may be mentioned, assisted by Mr. Davey (Chemist) and Mr. Mason (Foreman). Starting right at the beginning, it was explained that from the storage tanks the tar is, as required, pumped by another Evans pump into special preheaters; and by the adoption of this method, a good deal of fuel economy is effected. The preheaters take up a certain amount of the heat of the distillate, and this heats the tar in the apparatus before it is run into the still; and therefore when the tar is passed into the still, it is just about the point of commencing distillation. There is a battery of ten 15-ton capacity stills, each with its accompanying preheater. Producer gas is being employed for heating the stills; there being provided for the purpose a Wilson's patent power gas plant. It is found that by the use of producer gas the fuel consumption is not increased; it being possible to keep well within the amount generally consumed under stills which are not worked in this fashion. With the help of a piece of chalk, Mr. Warnes gave his visitors a very full explanation of the construction of the stills.

The distillate from the stills passes through the preheaters, by means of a water-jacketted coil, so that when necessary the coil may be kept hot by circulating hot water. The distillate then drops into collecting boxes, and from there into divider boxes, so long as crude naphtha and ammoniacal liquor come over. After these distillates have stopped, the divider boxes are cut out, and the oil which next distils over is allowed to run through another main fitted to the collecting boxes, to the various reservoirs provided for collecting the different fractions. The worm ends and collecting boxes are connected with foul gas mains, in order to minimize foul odours; the foul gases being burned under the boilers. As regards the provision of foul gas mains, it may be mentioned that one is also furnished in connection with the pitch coolers. This method, it is pleasing to note, operates so satisfactorily that the Alkali Works Inspector invariably makes a good report upon it. There are a series of boilers provided with steam coils inside to warm up the distillates if it should be necessary, as sometimes happens in the winter time.

After the distillation is completed, the pitch is allowed to stand in the still for a few hours, and is then run into the cooler, where it remains for a number of hours longer. It is then run off into the bay (which is previously whitewashed) to solidify. After solidification, it is dug out, by the aid of wedges and sledge-hammers, and loaded into railway trucks.

The various distillates are passed through the carbolic plant. This plant is of the modern type, using carbonic acid gas to recover the phenols. By this process, which is continuous, the carbonate of soda obtained is recausticized and used over again. Therefore there is no great waste of caustic soda. The lighter distillates from the tar are washed first of all to remove the phenols, then re-distilled in stills something like tar stills, after which they are re-distilled in special steam stills. They are then washed with acid and water. After washing, they are run into special stills provided with fractionating columns, and there separated into benzol and naphtha, and so on.

One interesting little point to which attention was drawn was in connection with the cocks about the works. Trouble is always being experienced with leakages from the ordinary gland cocks, owing to the strain to which they are subjected by the blowing of steam through the mains to prevent solidifying. The loss of benzol and creosote in this way is, however, found to be obviated by the use of a special Butterfield type of cock. This costs about twice as much as the ordinary gland cock; but it lasts a great deal longer. In fact, the one on the works which the members inspected has been in use now for about nine months, without having developed any leakage. Another point of which note was made by his hearers was a general formula which Mr. Warnes gave for ascertaining from the Twaddel the amount of free carbon in tars received in the Midland district. This was as follows:—

$$\text{Free carbon} = 0{\cdot}8n - 10$$

where n = the degrees Twaddel of the tar.

When the party reached the laboratory, the various methods employed for testing the different products were explained as fully to them as had been the case in connection with the distilling processes carried on at the works.

One more matter may perhaps be picked out from the mass of valuable information which was furnished to the members during their inspection. It has been found at these works by investigation that corrosion of plates of the tar stills is due practically to the dissociation products of ammonium chloride. It is further thought that, at the high temperature obtaining in the stills towards the end of the process, when steam is being introduced, some of the steam is dissociated also, and that this assists materially in the general corrosion.

At the conclusion of the inspection, the party assembled in the offices connected with the works; and here expression was given to the feelings of the members with regard to the pleasant and instructive afternoon which they had spent.

The PRESIDENT (Mr. A. O. Jones, of West Bromwich) proposed a hearty vote of thanks to Messrs. Hardman for allowing the members of the Association to come and see their works, and to Mr. Warnes and his assistants for showing them round. Everything had been explained in great detail to them—in fact, they had had quite a treatise on the subject of tar distillation; and altogether the visit had proved most interesting.

Dr. W. B. DAVIDSON, who seconded the proposition, said he was very glad to have an opportunity of expressing how deeply they all appreciated the amount of instruction they had received that afternoon. They could not have had a better or more lucid statement of all that went on in a tar distillery. It was far better than listening to a dozen lectures, to come there and see the actual processes and actual apparatus, and have a practical explanation given by a man like Mr. Warnes, who had the subject at his fingers' ends.

The vote having been heartily accorded,

Mr. WARNES thanked the members, and said he would convey what had been said to the Directors, who would understand that he had done his best to entertain the party, and that the visitors had appreciated the manner in which he had done it. He thought he had made everything clear; but there were, of course, many things to learn in connection with a tar distillery.

Presentation to Mr. William Ford.

At the annual "Smoker" in connection with the Stockton Gas-Works Social Club (presided over by Mr. Matt Dunn), a very pleasing item of the evening's enjoyment was the presentation of a silver salver, suitably engraved, by the staff and employees, to Mr. William Ford, the Manager, on the completion of his forty years' management. Mr. Dunn made the presentation, and conveyed to Mr. Ford the cordial wishes of himself and colleagues that he would have good health and happiness for many years to come. Mr. Ford feelingly replied, thanking all for the kindness conferred upon him. He spoke of the happy relationship which existed between himself, Mr. Dunn, and the whole of the gas-works employees. The programme consisted of musical and other items; and during the evening reference was made to the departure of Mr. Ford's son to Vancouver (B.C.), where he is now occupying the position of Chief Assistant to Mr. J. C. Moon, the Engineer and Manager to the Gas Company there.

The New Holder for the Toronto Gas Company.

In the report of the Directors of the Toronto Gas Company which was presented at the annual general meeting on the 26th of October, it was stated that the Directors had decided, in view of the continued rapid increase in the consumption of gas, to erect another gasholder having a capacity of 5 million cubic feet, which would be by far the largest in Canada. It may be remembered that, in the report upon the condition of the Company's works made by Mr. Thomas Newbigging, he said the only marked deficiency he found when he inspected them was in the storage; the capacity of the existing holders being considerably short, instead of in excess, of the maximum day's production. At the time of the meeting, tenders for the new holder, submitted by the principal English and American firms, had been under consideration, with the result that the lowest was accepted. We are pleased to learn that it was obtained by an English firm—Messrs. C. & W. Walker, Limited. The holder will be contained in a steel tank 216 feet diameter and 39 ft. 9 in. deep—the largest of its kind, we believe, in the world. In order to withstand the stresses which will come upon the sides, very heavy plates (some of them being 1$\frac{1}{16}$ inch thick, and weighing 4¾ tons each) will be used. The four lifts of the holder will be respectively 213 ft. 6 in., 211 ft., 208 ft. 6 in., and 206 ft. diameter and 38 feet deep. The framing will consist of 24 lattice-work standards and five tiers of lattice-work girders; and the height to the top of the standards from the bottom of the tank will be 196 feet. The superficial area of the holder, when fully inflated, will be upwards of 130,000 square feet. This is the third gasholder supplied by Messrs. C. & W. Walker to the Company—each larger than its predecessor.

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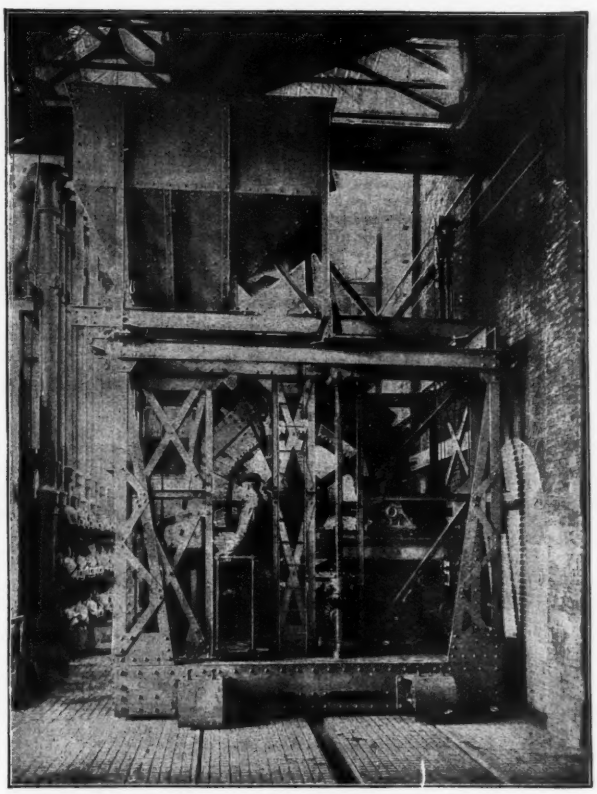

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FERRO-CONCRETE CONSTRUCTION.

By Harry W. Taylor, Assoc.M.Inst.C.E., of Newcastle.

[Extracts from a Paper read before the Association of Water Engineers.]

It will be generally conceded that suitable design and good construction are the two most essential conditions in ferro-concrete work. Should either of these requirements be absent, the result is almost certain to be unsatisfactory.

Factors of Safety.—The author suggests that before designs are prepared the following particulars should be definitely settled:—

(1) The live (or applied or accidental) load per unit.
(2) The factor of safety for the live load (usually about 4).
(3) The factor of safety for the dead load (usually about 3).
(4) The test load (which should be 1½ times the live load).

For the walls and floors of reservoirs, and especially for water towers, the author is of opinion that a higher factor of safety should be used; and in his experience a factor of 5 or even 6 is none too much. Water pressure is the most searching of all pressures, and though theoretically a higher factor is not needed, this is essentially a case where theory and practice differ.

The author is of opinion that the factor of safety should be based on the elastic limit of the steel. The live or working load should not exceed one-half of the elastic limit, while the test load should not exceed three-quarters of it. Factors of safety are, however, very generally stated in ratio of the breaking weight, and therefore the elastic limit of the steel should be doubled when this ratio is adopted. As an example, with steel whose elastic limit is about one-half of its ultimate strength, the factor of safety would be described as 4, for one-quarter of the breaking load. The author welcomes the recommendations made by the R.I.B.A. Joint Committee, and it seems fairly certain that these will be the standard regulations in the British Isles for some years to come.

Design of Centering.—The primary object in designing centering should be ease in removal and facility for quick re-erection, a point of the utmost importance where there is much repetition on a contract. A careful study of the most suitable arrangement of the centering is time well spent. It should never be forgotten that the cost of centering is nearly always a large percentage of the total cost of the structure, and economy on this item will frequently mean an appreciable sum of money. Where it is possible and the smaller spans permit, it is frequently desirable to arrange for the floor slab centering to be carried on the secondary beam troughing, and for this troughing to be carried in turn on the column boxing. With large beams of considerable span this, generally speaking, will not be possible, and arrangements must be made for the beam troughing to be carried by struts. The beam troughing should be so designed that the under or bottom board may remain in position after the side boards and the floor centering have been removed. All struts under beams, &c., should be wedged from below at the floor level, and not at the top of the struts.

It is also advisable to chamfer the arrises of the columns and beams, as giving a much more pleasing appearance to the work, also to give a camber to the beams of about ½ inch in 10 feet. If this is not done, the beam, though perfectly straight, will appear to the eye to sag at the centre. The ends of the beams should be haunched on to the supports where possible, and especially in continuous beams. Thick timber is better than thin, as it lasts much longer, and stands rough handling better, and, generally speaking, is more economical in the end. In the construction of walls it is generally advisable to fix the outer shuttering first, then place the steel in position, and add the inner shuttering and concrete as the work proceeds. To keep the inner and outer faces of the shuttering for walls the proper distance apart, perforated wood plugs or concrete separators are used; a bolt through the hole keeping the shuttering all tight and rigid. After the shuttering is removed the holes left in the concrete are, of course, filled.

Where a smooth surface to the work is required, the face of the timber touching the concrete should be wrought and coated either with mineral oil, boiled soap, or whitewash. These also preserve the life of the timber by preventing the liquid cement soaking into the pores of the wood. If the surface of the work is to be afterwards rendered, boiled soap or whitewash may be preferable to oil; in any case no animal oil of any kind should be used, but only mineral oil, such as crude petroleum. After all the centering is fixed and coated with oil or soap, and the steel placed in position, it is advisable to thoroughly flush the centering and moulds with water before any concreting is commenced.

Steelwork.—It will save considerable time if the steel is delivered cut to the required lengths, as by this means a good deal of smith's work on the job will be avoided. A convenient way of bending the smaller bars is to use a long temporary bench, constructed of thick timber with strong pins or plugs in same to bend the bars upon. These pins should be arranged to form a template, and thus the work will be accurate and expeditious. Generally speaking bars up to ⅝-inch diameter can be bent cold, but larger ones should be bent hot; and it is desirable that the heat at which they are bent should not exceed a cherry red. A white heat is not desirable. Smooth bars whether round, square, or hexagonal must be anchored at the ends, either by bending at right angles or by splitting open like a fish-tail or by means of a washer and nut—the latter being probably the most effective method. Steel bars in floors and walls must be crossed, and bars in the beams must be cranked-over the supports irrespective of the system used. Where openings occur, either in floors or in walls, it is always advisable to put additional steel round the openings. It is always preferable to have the inside of the steel work of a column as clear and free as possible from projections so that the ramming of the concrete may be thorough. It is in every way desirable that all, or nearly all, bars where they cross each other should be wired together with soft iron wire—thus guarding against displacement when the concrete is being rammed around them. This takes a little while, but is time well spent, and results in good homogeneous work.

Concrete.—Good concrete should be dense; that is to say, containing as few voids as possible. In this respect the selection of the gravel and sand is a matter deserving great care and attention. Hitherto it has been the custom to specify that concrete shall be composed of so many parts by measure of gravel, and so many parts of sand to one part of cement, regardless of voids in the two materials. This, in the author's opinion, is a mistake. The proportion of voids in the gravel and sand should be ascertained, so as to obtain as dense and homogeneous a mass as possible. It is much more satisfactory to test the voids in the aggregate on each contract, as it rarely happens that the aggregate comes from the same source on two consecutive works. Voids in clean, sharp sand vary from 30 to 50 per cent.; and this space must be filled or the resulting work will be porous.

Specifications very frequently call for coarse, sharp, clean, gritty sand; but the author believes a sand containing a proportion of fine particles is preferable in the majority of cases. Of course, a dense concrete is not always needed, such, for instance, as internal floors; but where work is required to be weather-tight, and especially water-tight, sand containing a considerable proportion of fine particles is in every way preferable. The dust or flour created by crushing stone is frequently removed; but if dense concrete is required the author is distinctly of opinion that this is a mistake. The presence of this dust certainly retards the setting of the concrete; but ultimately it becomes quite as strong as, and is certainly much denser than, concrete made without the dust. In depositing concrete in the moulds and centering, the chief object is for it to be homogeneous. If it is dropped from a height (even of 6 or 7 feet) the larger stones tend to separate from the mass and honeycombed work will result. Concrete should not be dropped more than a couple of feet. If it must descend from a greater height than this, it is better to slide it down a pipe or shoot. The author's experience is that wet concrete is preferable to plastic concrete, because it fills the moulds and spaces better, and flows between and around the steel bars more freely.

Whatever materials are used for rendering concrete waterproof, it is necessary that they be such as will not affect the strength and durability of the concrete. It has been clearly established by tests that the presence of a small percentage of fine clay does not necessarily injure the strength of the concrete, while it certainly assists very materially in securing a more waterproof concrete. This is, of course, altogether contrary to the former opinions of engineers,

and when judged by earlier teachings is a "heresy" of the most pronounced type. The use of soap and alum is fairly well known, both applied either as alternate washes on the concrete or as a solution in mixing the mortar for cement rendering. The addition of a soap and alum solution to cement rendering is undoubtedly beneficial where a water-tight surface is required; but it must be remembered that if the sand itself is coarse and sharp, the resulting work will probably not be watertight—there being an insufficient percentage of small particles to thoroughly fill all the voids. A material which is largely used on the Continent for this purpose is powdered pumice stone or "trass." This is sometimes mixed with the concrete; more often with the rendering only. Two layers of rendering, the first composed of equal parts of sand, trass, and cement, and the second of equal parts of trass and cement, will usually give a perfectly watertight surface. The author has used it with eminently satisfactory results. The trass makes a fat fixture, and, to use a plasterer's expression, works smooth and "slick."

Maturing of Concrete.—It is often advisable to make test cubes from the same concrete that is being used on the works, so as to note the process of hardening. It is important that the moulds in which these test cubes are made should be thoroughly wet when the concrete is placed in them, or the dry wood will suck the moisture out of the concrete, and consequently the test will be of no real value. The author, however, prefers to place reliance upon the actual concrete work itself, and considers it better practice to test important beams with a chisel to ascertain their hardness. If this is done near the neutral axis, it will not affect the strength of the beam.

Removal of Centering.—Generally speaking, it will be safe to remove the centering from under floor slabs in from 7 to 14 days after the concrete has been deposited. The side-boards of the beams and the boxing of columns may also be removed in about the same time. The bottom boards under beams of spans, say, up to 20 or 25 feet, should not be removed for at least four weeks, while for longer beams an extra length of time for hardening should be allowed. It is a good practice to nail a date tag on the beam troughing when the concrete was deposited in same. Should frost occur shortly after concrete has been deposited, the duration of the frost must be added to the number of days given above for the removal of the centering. A rule should be made on all contracts never to touch the struts under the bottom boards of the beams until the concrete has set hard, or damage by shear is almost certain to result. Workmen have sometimes been known to temporarily remove these struts and replace them; but the risk of so doing is great with green concrete, and such action should be rigorously forbidden.

Frost and Heat.—It occasionally happens that work has to be finished within a given period irrespective of weather conditions; and if such work should be driven into the winter, risk of frosts will be incurred. Where it is feasible and time permits, the author thinks it better to stop work altogether, and protect the portion already done in the best manner possible. This can generally be accomplished by covering the concrete with hay or straw about 12 inches thick, with boards or matting on the top. Where, however, the work must be finished regardless of frost, special precautions must be taken. Probably the simplest way is to heat the gravel and sand to about 70° or 80° (Fahr.), and use warm water of about 100° temperature in mixing the concrete. Immediately the concrete has been placed in position, it must be protected by canvas tents connected with salamanders or fires by hot-air pipes. The pipes should be placed near the concrete, so that the hot air from the fire can pass inside the tent formed by the canvas, and thus raise the temperature sufficiently to protect the concrete from frost. During hot, dry weather, and especially where the sun can play directly upon it, the concrete will dry very rapidly. Provision must be made in such cases both for screening the concrete from the sun and also for keeping it moist. The surface of newly laid concrete should be kept in a moist state for not less than six or seven days during hot weather.

It is frequently contended that ferro-concrete is in its infancy, and that sufficient time has not yet elapsed to form a reliable opinion as to its lasting qualities. The fact that such a large number of structures have been built, especially during the last 15 years, and have answered their purpose perfectly, is in the author's opinion reliable evidence as to the strength and durability of properly designed structures. It should always be remembered that if a ferro-concrete structure is inherently weak, it will fail when first loaded. As the concrete continues to harden for 10 or 15 years, its strength increases also; and the author has yet to learn of a case where a ferro-concrete structure having been erected, say, for five years has afterwards collapsed.

Discussion.

Mr. Easton Devonshire (London) said he had had some experience of ferro-concrete work; and he regarded a paper of this sort as a modest contribution to the knowledge of the subject, which, he was sorry to say, was still very limited in this country. Taking Mr. Taylor's communication so far as it went, and assuming the generalizations applied, no matter the local conditions, to the use of reinforced concrete, there were two or three points to which he should like to allude. In referring to the design of centering, the author said: "The primary object in designing centering should be ease in removal and facility for quick re-erection—a point which is of the utmost importance where there is much repetition on a contract. A careful study of the most suitable arrangement is time well spent." He (Mr. Devonshire) had had experience of failure; and they had been told in a previous discussion that the reason for failure was what they should all confess. In his opinion, the primary object in designing centering should be its rigidity for practical work, bearing in mind, secondarily, the facility for its removal. If anyone tried to save money by putting in thin boards where there should be thick ones, there would be failure. The author mentioned that steel bars should be crossed in walls, &c. It was, he (Mr. Devonshire) thought, difficult to generalize to that extent. The crossing of steel bars in floors and walls was essential in order to get what he might call a continuous steel structure to which they could work. But the method of their attachment, and whether they were calculating on the steel bars acting in two directions or one, were all-important in making such a general statement as to their cranking and crossing. He thought this remark might be applied, generally speaking, either to walls or floors or roofs in any construction. Then another practical factor they could get at was the weight of the steel reinforcement in relation to the thickness of the slab. It was only repeating, however, what had often been experimented on, and proved, over and over again. The question of the relative advantage of wet concrete over dry was one that had been threshed out, and thoroughly proved, in the construction of reinforced work. Where one had a steel core, it was necessary to have wet concrete; and experience showed that one could go up as high as 20 per cent. in weight of water in the mass of concrete without danger. Coming back a little to the construction of walls, the author stated that the shuttering must not be built up high on the one side. He (Mr. Devonshire) understood this to mean that the boarding might be put up to the full height on one side, and kept down on the other. In practice, however, he had found this to be very inconvenient. The matter of rendering was highly interesting. It was quite sufficient to make a good mortar of clean sharp sand and cement in the proportion of 1 to 1; and, properly rendering to the thickness of an inch on good concrete, any structure would be made water-tight. Structures so treated in connection with the Antwerp Water-Works many years ago had never leaked. In a recent construction of two storeys—that was, of filters superimposed—built of reinforced concrete a height of 15 feet from the ground, the columns and girders being reinforced with Kahn bars, and the walls with expanded metal, they had simply rendered it on the inside the thickness of an inch, and it did not leak.

Mr. H. Preston (Grantham) said he had never used reinforced concrete in the ordinary sense, but had often used hoop-iron in concrete; and some tests he had made about eighteen months ago were interesting from the fact that it brought out the great advantage that was gained by the use of a bit of metal. The bars, as before, were 6 feet long and 6 inches square. He made two of these test-bars from the same mixing—one of plain concrete; the other with four rods or bands of hoop-iron placed so that the bar could be tested with the hoop-iron either flat or on edge. After six weeks, he tested them. The one without reinforcing broke after 399 lbs. had been applied. The first test with the reinforced concrete was up to 952 lbs.; the second test, to 2754 lbs.; and the third test, when they weighted it up to breaking-point, to 3122 lbs.* It was a simple and perhaps a somewhat crude test, but it satisfied one as to the advan-

* Photographs of these various testings were exhibited.

tage of using reinforcement. But what was really of most interest to him was the manner in which the bar broke. It appeared from photographs he had taken to have fractured along the plane of the hoop-iron, and was due possibly to the final buckling of the iron bands. As time went on, one would be sufficiently alive to reinforced concrete to adopt it, because he believed there was great advantage in getting the steel strength into the concrete.

After some remarks with regard to the use of slag in connection with ferro-concrete work,

Mr. H. W. TAYLOR, replying to the discussion, said he quite agreed with Mr. Devonshire that, in fixing the centering, it must be quite rigid. He might perhaps amplify his paper by saying he was careful to specify a minimum thickness of timber for use in all centering. He rarely allowed anything under 1½ inches thick to be used for any part of the work; and for the bottom boards in beams, nothing less than 2 inches. If this was observed, and the work properly strutted, the structure did not sag at all under the weight of the concrete; and good construction would be obtained. As to the steel bars in walls and floors, what Mr. Devonshire had said was quite true. Perhaps in 50 per cent. of the cases the slabs were reinforced in one direction only; that was to say, the stresses were taken in one direction. But it was politic to have cross bars or bond bars running at right angles; and it was policy not to skimp these bars. With regard to the construction of walls, he quite agreed with Mr. Devonshire that walls should, where at all possible, be carried up evenly; but he did not agree with him that the outer boarding or shuttering should be carried up evenly with the inner one. He found that contractors much preferred to do it as he suggested in the paper; and his experience was that the fixing of the outer boards first, and the carrying up of the inner boards and concrete regularly, did not interfere with the construction at all, neither did it interfere with the homogeneity of the wall. He did not agree with Mr. Devonshire that, if one used a clean sharp sand mixed with cement in the proportion of 1 to 1, one always got a water-tight job. This was what made him (Mr. Taylor) think; and he had consequently made a good many experiments on the point, which showed that it was essential there must be a considerable proportion of fine particles in the sand to more than fill the voids; and he was glad to hear that Mr. Devonshire bore him out in this contention fully.

Mr. DEVONSHIRE: By clean sharp sand, I mean that I should take the sand in its natural state, and see that it was clean.

Mr. TAYLOR said he wanted to emphasize this point. It was necessary that the sand used for rendering should contain a large proportion of fine particles. As to the use of slag, there had been a great diversity of opinion. His experience was that slag should never be used where it could possibly be avoided. It was risky, dangerous stuff. They might get slag suitable in every way from one part of a heap, when the works were making a particular kind of iron; and from the other side of the same heap, they might get slag of quite a different sort, and containing considerable proportions of sulphur or phosphorus. He had, in consequence of this danger, rigidly excluded slag from all the work that he had carried out.

"Transactions" of the Société Technique.

We have received the volume of proceedings of the Société Technique du Gaz en France for the past year. It contains the report of the thirty-sixth annual congress, held in Lyons from the 22nd to the 25th of June last, under the presidency of M. Auguste Godinet, the General Manager of the group of gas undertakings in the hands of MM. P. de Lachomette, Villiers, et Cie. Most of the technical matter in the volume has already been noticed in the "JOURNAL." It is followed by a report of further meetings of the Committee on the Standardization of Screw-Threads for Gas Appliances, notices of the life-work of deceased members, particulars of the competitions for the current year, lists of prizes awarded by the Society, names and addresses of members, &c. A useful table is given of the contents of the volumes of "Transactions" for the thirty-six years from 1874 to 1909. In a supplement will be found a collection of the technical abstracts made by M. Payet, together with a tabulated synopsis of the subjects dealt with in this and the preceding volume. This is followed by a review of the legal business of the year 1907-8 by M. de la Taste; and the index to the cases as far back as 1884 is brought up to date. Though M. Payet has relinquished the secretaryship of the Society, it may be assumed that this volume of the "Transactions" has been produced under his supervision.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

A Meeting of the Western District Division of the Scottish Junior Gas Association was held in the Technical College, Glasgow, last Saturday evening—Mr. D. CURRIE, of Stirling, the President, in the chair.

The PRESIDENT intimated that Mr. V. M. Evans, a representative of the James Keith and Blackman Company, who was to have read a paper on "High-Pressure Gas Distribution," had found it inconvenient to be present, and he did not care to have his paper read by a deputy. They had been fortunate, however, in being able to get a paper on the same subject from Mr. Arthur Robinson, who was also connected with the Company.

Mr. ROBINSON then read the following paper:—

HIGH-PRESSURE GAS DISTRIBUTION.

The title I have chosen for my paper is one which covers a vast field; but it is my intention to confine myself more particularly to that part of the subject which appertains to the "boosting" or supplying of gas to outlying districts. This is a question which in recent years has occupied a very large amount of attention among gas engineers, in this and in other countries, and one which is destined to revolutionize gas-works methods to a large extent.

Of recent years, as my audience are fully aware, very large demands for gas have arisen in connection with cooking, heating, and industrial purposes; and in many instances these demands are from districts or villages lying at some distance from the gas-works, and from which districts no great demand was anticipated when the mains were laid down. In consequence, these mains are found to be of too small a size to adequately deal with the largely increased consumption, more especially at times of peak load. Another difficulty met with is in cases where gas-works supply gas to distant holders, put up originally to relieve the works themselves—that is, the holders could be filled during the hours of least demand, and would store sufficient gas for a considerable period for supplying the outlying districts.

Matters have come to such a pass in many cases that the gas-works are unable at any time to supply even the holders. To put it another way, the carrying capacity of the mains to these local holders has been overtaxed by the increased demand for gas from the district itself. The question therefore arises whether or not to put down new mains of larger size. The inconvenience of this method is well known to you all, to say nothing of the heavy capital expenditure required.

For any small additional quantity of gas required, it is possible, of course, if the holder would stand it, to increase the pressure given by it. The only other alternative is to put down what is now generally known as a "boosting" plant. The question I shall probably be asked is: What effect has this boosting, or increasing of the pressure, upon the illuminating power of the gas? I think I can dispose of this point in a few words. For all moderate pressures such as I wish to speak of, the loss in illuminating power is quite negligible. It has been found that the actual loss by compression, with pressures up to about 5 lbs. per square inch, is practically *nil*. Of course, when it comes to high-pressure distribution, with which the American gas engineers are more or less familiar, there is a distinct loss in illuminating power; but for our purposes this point can be disregarded.

Another question likely to be raised is: If the mains are not in good condition, what effect will the increased pressure have on leaks? The only answer that can be given is that the amount of the leakage will be directly proportional to the square root of the difference of pressures; and the thing to be done, if the pipe-line is in bad condition, is to see that the leakages are made good.

Another use for boosting plants that I might briefly touch upon is that in which low-pressure supplies might be boosted up, or reinforced, by carrying the high-pressure main along, and connecting it up, through suitable governors and at suitable points, to the low-pressure main—this having the effect of permitting a larger carrying capacity of the low-pressure main than would be otherwise obtainable. A case which I might cite, and of which members will doubtless have read, is that of the city of St. Louis, in the United States, which has a 24-inch cast-iron pipe laid completely round the city, and into which the gas is compressed by rotary blowers to a pressure of 5 lbs. per square inch. This circle is used during light loads as a high-pressure distributing main to fill the holders scattered throughout the city, so that at the time of peak load both the holders and the ordinary supply main could be depended upon to meet all requirements. At certain points where the pressure was particularly low in the low-pressure distribution system, connections were made to the high-pressure main, with suitable governors.

There are several types of plant used for the purpose mentioned above; but the more general method in this country is by means of rotary compressors or blowers, and, for lighter pressures, centrifugal fans. Either of these types of plant can be arranged for driving by any available power—by belt, by direct-coupled electric motor, or, in the case of the rotary blowers or exhausters, by a direct-coupled gas-engine; and where the cost of water is not a consideration, then by water-turbine drive. The class of apparatus most familiar to my hearers will be the rotary exhauster type; and I may perhaps be permitted to give a few particulars of the patent

compressor or blower manufactured by the firm with which I am connected.

The Keith patent rotary gas-compressor consists of a positive rotary blower of special design, fixed upon a box base containing the inlet and outlet connections, and the automatic pressure control and return valve. The blower proper is of the eccentric drum type, being fitted with four blades. Several novel features have been introduced into the design. The blades are now made hollow (so as to reduceas far as possible the centrifugal effect), and well stayed between the surfaces; and in order to still further lower the pressure of the blades on the outer casing and reduce the centrifugal effect, they are so arranged that the opposite blades almost completely balance each other. Segmental gun-metal blocks are fixed on the inner ends of each of the blades, working on steel pins. The outer edges of these blades bear on the inside edges of the rings, which are made stiff enough to prevent distortion; and in this way the blades are limited as to the extent to which they can fly out by centrifugal force, and practically balance each other. As the outer ring revolves with the blades, and receives the pressure due to centrifugal force, which is very considerable, the frictional loss usual with this type of blower is very greatly reduced. The blades proper are made so as to keep slightly clear of the outer cylinder in all positions, and the extra distance is made by sliding packing-pieces, which are kept out by centrifugal force. The end covers of the cylinder are jointed in a novel manner, which preserves the end measurement of the cylinder, and still permits the joint to be broken and re-made as often as desired without destroying the packing.

The common fault with rotary blowers of this type is the pulsating effect given by the blades on the discharge side, which is caused by the sudden compression of the gas between any given pair of blades as the space is brought round to the delivery opening, as practically no compression takes place up to this point. This difficulty is overcome by providing a special port which feeds the space gradually before it reaches the delivery port, and which action is carried out without any loss in efficiency. The box base is divided into two portions—one being connected with the low-pressure gas supply and the inlet to the blower, and the other to the outlet of the blower and the service-pipes leading to the burners. These spaces act as reservoirs, which still further reduce any pulsating effect of the blower on the supply or discharge. In the partition between the two spaces is fixed the automatic pressure regulating and return valve, consisting of a special design of safety-valve with an oil dash-pot fitted. This valve is loaded with disc weights on the top, so as to blow off at the exact pressure desired.

A continuous automatic lubricating device is fitted to all machines of this type when arranged for pressures of 1 lb. per square inch and upwards, which gives ample lubrication—considerably more than is possible with sight-feed lubricators—and is very economical of oil; a quantity being poured in at the filling-plug, passing through the oil-pot in which the valve works, and then overflowing into the base. A copper tube is fixed in the connection at the base, and carried up to the lubricator, which consists of a sight-feed tube with a regulating screw, having a small gauze filter to keep back any particles of grit. This lubricator is fitted to the back bearing of the machine, and as this bearing is always in connection with the low pressure, the high pressure in the base is able to force the oil up to the lubricator, and thence to the interior of the eccentric drum. This oil is then thrown out by centrifugal force to all parts, and is finally discharged back again to the back, whence it is again forced up to the lubricator. When sufficient oil is put in to start with, the machine will run several months without requiring any addition, providing the stuffing-box is kept reasonably tight and the lubricator is not allowed to pass too much oil into the blower. This new method of lubricating considerably increases the efficiency of the blower, causing it to run more quietly than the ordinary sight-feed lubricators. It is self starting and stopping, and when the regulating screw is once adjusted, it need not be touched.

For dealing with large volumes of gas at moderate pressures, the most suitable type of plant is that known as the centrifugal fan or blower. These machines, though not capable of giving pressures obtained by the use of positive rotary compressors, can be arranged to give up to about 24-inch water-gauge pressure, and at the same time deal with very large quantities—they having the great advantage of being much less in cost when compared with plant of the positive rotary type arranged to deal with the same quantity of gas. The pressures given by these fans or blowers is proportional to the speed at which they are run; and, following on this, the higher the speed the larger the quantity of gas delivered. As an instance, take a small Keith-Blackman No. 1 gas-blower. This, when run at a speed of 3100 revolutions per minute, will deliver 12,000 cubic feet of gas per hour at an increased pressure of 2 inches. To obtain an increase of 4 inches, it would need to be run at 4500 revolutions per minute, and would then deliver no less than 16,000 cubic feet per hour at the higher pressure. In a few cases, it has been found that the speed at which these fans should be run is a disadvantage. To overcome this, my firm have brought out what is known as their special narrow pattern fan, the chief features of which, when compared with the above-mentioned blowers, are the reduced speeds, and the possibility of increased pressures up to (say) 24 inches water column; the first-mentioned blowers only being capable of dealing with pressures of about half that of the narrow pattern.

In this connection, I should like to bring to your notice plant which has just been installed for the Tynemouth Gas Company. Formerly the gas-works supplied a holder about a mile from the works at the east end of the town; the holder being filled during the periods of light consumption, while in the hours of heavy consumption it gradually emptied itself, thereby augmenting the works supply through an 18-inch main. The Company, however, decided to abandon the holder, and increase the delivering capacity of the 18-inch pipe by means of a pressure-raising plant, so as to bring up the pressure to the main necessary to maintain a constant delivery of gas of 200,000 cubic feet per hour. The plant now installed is duplicated throughout; each set consisting of one Keith-Blackman blower driven by a direct-coupled electric motor, and each blower being capable of dealing, while running at a minimum speed, with 200,000 cubic feet of gas per hour, at an outlet pressure of 13 to 14 inches—the inlet pressure to the fan being from 5 to 9 inches. The electric current for each set of motors is generated by efficient dynamos connected by belt for driving with suitable gas-engines; all the necessary switches, &c., being supplied with the plant.

This is an instance I have given simply to show the trend of opinion with regard to the use of blowers or fans in gas-works themselves. An installation nearer home, to which I may be permitted to refer, is that at the Lochgelly Gas-Works, where they have the positive rotary type of blowers in duplicate, connected through flexible couplings to suitable gas-engines. This plant is used for sending gas a distance of some two miles through a 4-inch main, tapped at intervals throughout its length to supply colliery districts and houses. An initial pressure of some 70 or 80 inches water-gauge is given by this compressing plant; and at each point where the main is tapped for the supply of small districts or clusters of houses, a Keith-Blackman type of diaphragm governor is used, to bring the pressure down again to whatever is required at the various points.

Another and a growing use for the centrifugal type of fans or blowers is the installation of one at the gas-works for the purpose of temporarily raising the pressure in order to actuate automatic lighting devices. This forms a particularly handy plant, for at certain pre-arranged times in the evening, when the street-lamps or others have to be lighted up, and when they are fitted with the automatic distance lighting arrangements, the blower can be started and run at such a speed as to increase the pressure temporarily to the extent necessary to actuate the apparatus on each lamp, and after a few minutes' run it can be stopped, leaving the lamps alight. Conversely, to shut off in the morning the blower is again started, and the increased pressure put into the mains again actuates the control, so extinguishing the lamps.

Discussion.

The PRESIDENT said Mr. Robinson had consented to throw his paper open for discussion, or to answer any questions put to him as to high-pressure lighting.

Mr. J. M'GHEE (Glasgow) said that most of the paper had been devoted to giving the members a very clear and comprehensive idea of the new blowers and fans introduced by Messrs. Keith and Blackman. He did not think Mr. Robinson was going out of his way when he stated that it was quite evident that the trend of gas engineering in the near future would be towards introducing the boosting system. It had become quite evident, if they took a city like Glasgow, with the enormous network of pipes of every description under the soil, and the great complication and expense there would be in introducing larger mains, that it had practically become prohibitive to do so; and when they were looking forward to a great expansion of their industry, by gas-fires and the like, it was obvious that the present mains would not carry the gas necessary to keep up the supply. There was only one way of meeting the difficulty, and there was a notable example of it in Birmingham, where they were laying a high-pressure gas-main. He did not think it was altogether a secret that in Glasgow they had it in contemplation to do likewise. They had had a great demand recently, and heavy work had been thrown upon the stations in meeting it. One of the main features of a high-pressure supply would, of course, be the provision of a suitable governor to reduce the pressure. This would be a very expensive arrangement. There were many places in Glasgow in which they could do with a high-pressure installation; but they were not prepared to face the expense of installing compressing plant themselves. It might be possible to light up a number of shops or factories in a range by fitting up a compressor in a central position; but unless a number could be got together, it was hardly worth while. If, however, a high-pressure gas supply were coming off the main, it would be quite an easy thing to accomplish. He thought it was evident to everyone that if gas could be delivered at high-pressure direct from the main, it would be a strong inducement to many firms who would not face the cost of providing plant themselves to take it at once. In America, they had certainly gone far ahead of what had been done in this country. Here high-pressure gas distribution had been carried out on only a small scale, and notably at Dunfermline and Lochgelly. He did not consider that in the matter of the loss of gas the mains need trouble anyone. The pipes were quite capable of standing very much heavier pressure than they had to bear at present. Oil gas which was used for lighting railway carriages was compressed up to 120 lbs. per square inch; and the pressure desired and necessary in most cities was about 2 lbs. per square inch. It was only a matter of jointing. If a joint were properly made at the beginning, there need be no doubt as to its standing the

requisite pressure. He might put to Mr. Robinson just one or two points as questions. There had been various little defects, of one kind or another, in installations; and he knew that Messrs. Keith and Blackman had taken great pains to overcome them. One of the drawbacks which had been felt was as to the position in which the installation would be in the event of the power failing. At present the result would be utter darkness. In their former installation, in which the pressure was from 8 to 10 inches, it was possible to switch on the low pressure, as he had done himself, and get a very good light until the motor was put in order. But under the new system, this could not be done. This meant the installation of a duplicate compressor, which would add to the expense. There was another point, which was put before him by the engineer of a large establishment in which plant had been installed. There were occasions on which it was necessary to have men working at night at one or two isolated spots. This meant that they had to keep their power running for one or two lights; and they found this to be expensive.

Mr. A. KELLOCH (Alloa) said the question of high-pressure gas supply was under consideration at Alloa two winters ago. They supplied an out-district by a 4-inch main, with a pressure of some 2 inches at the works. To put down a new main meant considerable outlay, as the maximum demand for gas was only about 1500 cubic feet per hour during the peak of the load. The scheme which seemed to them to be most feasible was the introduction of a compressor; and they installed one, driven by an electric motor. It was fitted in the town, about two miles from the village that was being supplied, and a mile from the works. The initial pressure was about 7 inches; and even at this they were not working the compressor at its full speed. The pressure at the end of the village was about 5 inches. They felt this was far too high at which to supply to consumers; and a service governor was put down to regulate to 3½ inches. They had been able by this means to stop all complaints as to want of gas. The cost of running the plant was about 1d. per hour for electric current; and they could supply 4000 cubic feet instead of the 1500 cubic feet required. The illuminating power of the gas had since in no way suffered by the introduction of the compressing plant. He had listened with interest to the previous speaker's remarks about defects in Messrs. Keith and Blackman's fittings. There was still another to which he would like to draw their attention—viz., the electric ignition apparatus. At Alloa they had introduced a high-pressure plant, similar to that which was in use in the Fleet Street installation; and the only difficulty they had had with it was that the electric ignition had failed to work. He understood that Messrs. Keith and Blackman had some new apparatus to put before them shortly. He hoped that this was so, and that there would be no further trouble with the lighting and extinguishing of the lamps. In their installation the gas consumption per lamp was about 2¾ cubic feet per hour, which would show that a considerable saving was being made, as compared with the old plant, throughout the works.

Mr. J. WEBSTER (Provan) considered that boosting of some description should be in use in all works. They had a pressure of from 8½ to 9 inches, and with this they could send gas into Dalmarnock—360,000 cubic feet, with the holder erect. When they came down to the second lift, Dalmarnock could supply Provan with gas, instead of Provan supplying Dalmarnock. When they came down to the lower lift, the gas just ran back from Dalmarnock. During the last fog, they had 200,000 cubic feet of gas in one of their 8-million holders, and they sent it direct to Dalmarnock and put it into a smaller holder, where they got a pressure of 6 inches. If they had not had a turbine, they could not have done so, because they had a loss of an inch of pressure on the road. With a small holder on they could take it down to the ground, and still keep up the pressure. With a booster running about 8000 revolutions per minute, they could send down from 800 to 900 cubic feet of gas at a pressure of about 15 inches; and they would not get 1-10th of oscillation on their station. Anything below 3½ to 4 inches pressure was now useless. They ran about 5½ inches in their district, and even with this they had complaints.

Mr. A. SMITH (Tradeston) said he had not had the experience of any of the gentlemen who had spoken regarding boosting or high-pressure gas-lighting, but it was evident that with the increased number of incandescent burners pressure must be increased. Within the last five or six years, the initial pressure had gone up 100 per cent.—from about 15-10ths to 30-10ths. The district supplied by the Glasgow Gas-Works being so extensive necessitated the consideration of boosting plant, because with a pressure of 5 or 6 inches at the works, which was the pressure under the present arrangement, this was found to be required to allow consumers at the far end of the mains to have anything like an adequate supply. This was their experience during the last fog they had. The pipes were simply drained before they reached the outlying districts. The question of leakage and unaccounted-for gas used to be considered a drawback in the early days of high-pressure distribution; but he thought that the reverse had been found in practice, and that with higher pressure the unaccounted-for gas had gone down.

The PRESIDENT said he considered that Mr. Robinson's paper was full of interesting material. The subject dealt with was one which should appeal to all of them as juniors, because high-pressure lighting had undoubtedly come to stay; and great advances might be expected in this direction in the future. The point raised by Mr. M'Ghee about the compressor breaking down, and there being no provision for lighting up temporarily, was one which, he thought, would appeal to most people in putting in plant for high-pressure lighting. He was talking about a fortnight ago to a gentleman about high-pressure lighting; and this was one of the points he had raised. In the event of high-pressure lighting breaking down in a factory where there were, perhaps, hundreds of employees, it would be very awkward—particularly if it were to happen at a busy time. On the screen Mr. Robinson showed them a flat-flame burner for high-pressure lighting. He took it that this flat-flame burner was for reducing the pressure to that of an ordinary flat-flame burner. He would like to ask how this burner was regulated—that was to say, if any burner could be regulated to suit a pressure of about 8 inches. There was another disadvantage, he thought, with high-pressure lighting, which was that, practically, a governor would be required at almost every service. The governors were very expensive; and they would be very apt to choke. He did not know whether there was a high-pressure governor on the market which was not liable to ckoke with naphthalene deposits and the like. It would be very awkward if they had the whole of the lights put out by the pipes choking up. He observed that Messrs. Keith and Blackman claimed to produce a light by the Fleet Street lamps of 60-candle power per cubic foot of gas. He asked at what pressure this gas was burned, and also what would be the illuminating power of the gas, tested according to the Referees' Instructions.

Mr. ROBINSON said he was much obliged to the members. Most of what had been said had been in corroboration of the paper; but there were one or two queries he should like to reply to. Mr. M'Ghee had anticipated a lot of the things they had been doing. For instance, taking the Fleet Street plant, they knew that they had the same plant in use in printing offices and the like in the neighbourhood. They had taken the gas into those works at high pressure, thereby giving a steadier light, and effecting economies. The same could be done in Glasgow, if a high-pressure system were put down. A great deal of interest had been taken in the question of boosting; and he wanted to restrict his paper that night to this question. The fact was that, so far back as four years ago, he was chatting with some gas managers about boosting, and they were contemplating at that time the first public installation that was to be in Scotland. They were thinking of linking-up small towns by this means, and he believed they would have gone on and done so, but they were a little cautious, and wanted, perhaps, to see someone else going forward before they did. He believed that if they had gone on they would not have regretted it. Of course, there was always the possibility of a stoppage of rotary compressors. The bulk of them were driven off the shaft; and if the shafting stopped, the compressor stopped too, or if the belt broke the place would be in darkness. This was a difficulty; and they met it in every case by recommending a duplicate plant, or a duplicate means of supplying power. If they had a gas-engine supplying the power, they might have an electric motor which could be switched on. Still, the compressors were very reliable. In fact, he did not know that they had had a breakdown yet with the rotary type. In the case of engineering works requiring a few lights at night, this was easily arranged, because on the compressor they had a pressure-valve, and they could allow the gas to go through at ordinary pressure; and by the fixing of a few flat-flame burners, or ordinary incandescent burners, they could get a light. Of course, care would have to be taken, in the morning, that the lights were switched off when the compressing plant was turned on. In the case of moving machinery, he admitted it was a difficult question. With regard to the point Mr. Kelloch raised about electric ignition, they were not troubled with this. It was a good idea; but it took some time to get these things perfect. He had word from his people that they had found out a new method of fixing the filaments, by which they would not be affected by the temperature. Regarding the adjustable burner, it was simply an ordinary Peebles governor. The intention of the burner was that in a high-pressure installation they might want a few flat-flame burners. The burner simply reduced the volume of the gas. They worked generally with a pressure of 4 inches of mercury, which was about 54 inches of water pressure. The result of 60 candles per cubic foot was obtained with London gas; but Mr. Herring had also tested the lamp, and he found over 80 candles per cubic foot.

The PRESIDENT proposed a vote of thanks to Mr. Robinson, which was heartily accorded.

INCANDESCENT GAS LIGHTING—SOME POINTS OF INTEREST.

The PRESIDENT intimated that Mr. L. Fletcher, the Chief Engineer to the Welsbach Incandescent Gaslight Company, Limited, had favoured them with a paper on this subject, which would be read by the Hon. Secretary. The paper was read, accordingly, by Mr. D. Fulton, as follows.

The revolution in gas lighting brought about by the introduction of the Welsbach mantle is fast becoming ancient history compared with the rapid changes being brought about in other spheres by the adoption of new scientific discoveries. But the marvellous efficiency, and the still somewhat mysterious cause of this wonderful light, render our subject always extremely interesting and fascinating. The old method of obtaining light by means of a luminous flame depending on the light emitted by the incandescent solid particles in the flame itself has, after all, much in common with the Welsbach light, in which the oxides of thorium

and ceria are raised to incandescence by means of a bunsen flame. The phenomena, however, of the old method are easily explained and understood; whereas the secret of the marvellous radio-activity of the 99 per cent. thoria mantle, containing the vitally important 1 per cent. of ceria, has yet to be explained in such a way that cause and effect can be as closely followed and understood. It is, therefore, first the extremely high efficiency, and, secondly, the somewhat mysterious origin, of the light, which make it so interesting from a scientific point of view; and this interest is only intensified by its simple and successful application in the practice of modern gas lighting.

We will briefly consider the principles underlying the successful application of the Welsbach mantle in conjunction with the bunsen burner, and discuss them under the following headings: (1) Suitability of gas supply as to both quality and pressure. (2) Burners, comprising low-pressure, self-intensified, and high-pressure. (3) Mantles.

In the early days of incandescent gas lighting, the vital importance of the quality and the pressure of the gas supply was not, of course, so fully recognized as it is now; and undoubtedly the new system of lighting was hampered exceedingly in consequence, as the gas then supplied was, in most cases, unsuitable for giving the best results with a bunsen burner for the two following reasons: (1) It was so rich in heavy hydrocarbons that it required a very large volume of air for its complete combustion; whereas the ideal gas for a bunsen burner is such a mixture as will only require (say) 4½ volumes to 1 of gas for complete combustion, instead of (say) 6 volumes with 16 or 17 candle-power coal gas. (2) The low pressure at which it was supplied, though necessary to enable the old luminous flame burner to give its best results, militated against the proper working of the bunsen burner, as the sluggish jet entering the bunsen tube had not the power to draw in its proper quantity of air.

This paper does not give us scope to discuss the constituents of the ideal 12 to 14 candle-power bunsen burner gas; but the subject will have had considerable thought and study from all of us. It will, however, be sufficient to say here that such a gas should not require more than 4½ volumes of air to 1 of gas for its complete combustion; and if it is delivered to the bunsen tube at any pressure over 2 inches, it would be an extremely poor burner indeed that would not yield a satisfactory bunsen flame under all working conditions. I do not mean to say that a successful bunsen burner cannot be made to give excellent results with a coal gas as rich as even 20-candle power; but we are putting a heavy load on the jet of sluggish gas as it issues to the bunsen tube, and unless our burner is kept in an ideal condition, the chances are that a sufficient volume of air will not be drawn in to produce a good bunsen flame. We then get a partial breakdown of the flame, a much lower flame temperature, and carbon deposited on the mantle. Undoubtedly, if we only consider our gas supply from a bunsen burner point of view, whether for lighting or heating, the reasons are all in favour of a gas of lower candle power, requiring the minimum of air for complete combustion while still being capable of producing flame temperatures of (say) approximately 1500° C. and upwards. There is, of course, something to be said on the other side for a medium quality gas (say, 15 to 16 candle power); and the writer hopes the matter will here be rediscussed. But he thinks all will agree that a minimum pressure of 2 inches of water at the inlet-nipple of the bunsen burner is necessary for general success.

We will now go on to heading No. 2, and briefly discuss the burners and the system at present in use. Though the upright burner is being displaced by the inverted type, we will discuss the former first; and we may roughly classify the upright burners into two sections—namely, the "C" type and the Welsbach Kern. The distinction between the two is clearly defined both from scientific and practical points of view, because in the "C" (chimney) burner about 2½ parts of air only to 1 of gas is drawn into the bunsen tube, and the flame temperature necessary to produce the excellent result given by the "C" burner is obtained by the secondary air supply conducted to the outer envelope of the flame by the glass chimney; whereas in the case of the Kern (chimneyless) burner nearly the whole of the air required for complete combustion—(say) at least 4 volumes of air to 1 of gas—is drawn in at the bunsen tube, and its increased efficiency is obtained without the aid of a chimney. The special double cone construction of the Kern tube induces a higher velocity of the mixture of air and gas flowing through the same; and, consequently, a much larger proportion of air is sucked in at the air-holes of the tube. And this results in a flame of very great intensity—the temperature of the hottest zone being from 1600° to 1700° C. In addition, the perforated mixing cone ensures the gas and air being intimately mixed, so that every molecule of gas is surrounded by sufficient air for its combustion, and there are no "streaks" of unmixed gas, as there are in a bunsen burner not provided with a mixing-device. Intimate mixing means highest possible temperature; and this in turn means highest possible candle power from the mantles. The increased efficiency of the Kern over the "C" burner is about 30 per cent. if both are working under best conditions.

It is not generally appreciated by users of incandescent burners that there is one zone in a bunsen flame which is very much hotter than the remainder of the flame; and this hyper-incandescent zone, as it is called, is situated just beneath the outer envelope of the flame, and is concentrated to a very great extent at the base of the flame.

Comparing the upright burners with inverted, it may at once be said the light yielded by an inverted burner is due largely to the secondary air supply, as in the case of the "C" burner; and it is doubtful whether an inverted burner has yet been produced which would yield a flame temperature as high as (say) the Kern upright burner. In other words, if the conditions obtaining in the best type of upright burner could be maintained when it was inverted, a higher efficiency would be yielded, as it is an undoubted fact that when you can take nearly the whole of the air into the bunsen tube you get a far more intimate mixture of air and gas, and therefore more complete combustion and higher flame temperature, as previously described, than can be obtained when you use a three to one mixture of air and gas and rely on the secondary air supply for external combustion in the envelope of the flame. This statement at first may seem contradictory; for we are all agreed on the apparently increased light given by the inverted burner. But I want to say that this is entirely due to the angle at which the light is reflected from the inverted mantle and the shape of the latter, and not to a flame of higher temperature, as, indeed, the inverted burner flame is of a lower temperature than the best form of upright burner (such as the Kern), and the combustion is not complete. It must not be assumed, however, that the advantage of the Kern inverted burner is being overlooked, and that I am advising a return to upright lighting; but rather I am endeavouring to point out that we should not be satisfied until the inverted burner has been improved so that it will yield a flame temperature as high as the best upright burner by the jet of gas drawing into the bunsen tube nearly the whole of the air required for complete combustion. To do this we must in some way prevent the overheating of the bunsen, as it is this, and this only, that at the moment prevents us from obtaining even far higher results than are at present yielded by inverted burners at ordinary pressures. I particularly mentioned "ordinary pressures," because if you employ high pressure the overheating effect, and consequent slowing of the flow of air and gas through the bunsen tube, is to a great extent overcome, and the burner is enabled to draw in a constant quantity of air, as the flow of gas and air is maintained at practically the same aspirating power; whereas in the low-pressure burner, although the jet remains constant, the expansion taking place immediately the gas issues into the overheated bunsen tube reduces the velocity through the latter to such an extent that it has no longer power to draw in the same quantity of air as when the bunsen tube was cold.

A very interesting and convincing experiment, illustrating the changes taking place in a bunsen flame during the rise in temperature of the burner itself, may be carried out by gradually heating the bunsen tube of an inverted burner. It will be seen that, although when the burner is quite cold and properly regulated the bunsen flame with an inner ring at the mouth of a whitish-blue colour and containing nearly all the air required for complete combustion is almost ideal, it rapidly changes to a "C" burner type of flame, with a large green inner cone, containing (say) 2 to 2½ volumes of air to 1 of gas, until, eventually, when the tube becomes nearly red hot, there is not sufficient air drawn in at the air-holes to render the flame non-luminous. Then take the same burner, or, at least, a burner with exactly the same nipple and construction, and surround the bunsen with an outer tube or casing, forming a water-jacket, and allow cold water from a vessel at higher level to flow through an inlet at the top of the jacket, permitting it to run away from an outlet at the bottom, thus surrounding the bunsen tube with cold water. You will see that your original conditions remain practically constant. If close observations are made during the above experiments, points of great interest will be noticed, and you will be amply repaid for the trouble in carrying them out. They will probably modify your ideas regarding "regenerative inverted burners;" and you will, I suggest, be convinced that the problem is, not to heat your burner or mixture, but to maintain the latter at a low temperature until it reaches the burner-mouth, as the loss of heat in feeding your flame with a cold mixture will be far more than compensated by the complete combustion you are able to bring about owing to the increased velocity of efflux of the mixture enabling your burner to aspirate its full quantity of air.

I mentioned under the second heading self-intensifying and high-pressure burners; but I do not propose discussing either of the two here, except to briefly examine the principles of each. The operation of the low-pressure burner is quite clearly understood; and we will now inquire into the principles underlying any high-power incandescent gas-burner, whether self-intensifying or high pressure. This is what we find. To obtain the maximum light from a given mantle surface area, it is necessary to consume efficiently as large a volume of gas as possible issuing from a burner-head made to fit the mantle in question. In other words, we concentrate a large volume of gas into the smallest possible flame by mixing with the gas its full complement of air, thus obtaining from a comparatively small mantle a light of great intensity—the light from each square mm. being about three times as great as from an ordinary mantle. For example, say we decide to consume 10 cubic feet of gas, and we want to render incandescent a mantle of (say) about 1 inch in diameter. This diameter of burner-head restricts the outlet area we can give to our mixture; and if we allow the mixture to issue in the ordinary way from the burner-head without any assistance, it will be found that the velocity of issue is not sufficient to draw in the full quantity of air at the air-holes for complete combustion. It is, therefore, necessary either to render the gas-jet more powerful by

increasing the pressure of the gas, as in the case of all high-pressure systems or the self-intensifying method of employing a draught chimney, or, if we may use the expression, increasing the pressure of the air as it enters the bunsen tube. Though in one case we have a push and in the latter case a pull, the result in both systems is that the necessary quantity of air is induced by the high-pressure gas-jet, or drawn in by suction of the draught chimney, and a mixture of air and gas giving complete combustion is brought about within the prescribed diameter, and we get a light of very high intensity.

It is not, perhaps, generally recognized that the outlet of a burner is the ideal point at which to control its power and capacity. Thus, within limits, if you increase your outlet area you draw in more air, and get more complete combustion; whereas if you gradually close your outlet area you reduce the volume of air drawn in at the bunsen tube, and the combustion is not so complete. The volume of air drawn into a bunsen tube may be regulated to the utmost nicety in this way, and is a far more delicate adjustment than can be obtained by means of an air-shutter on the bunsen tube itself. But there are, of course, difficulties in using adjustable burner-heads.

The really practical bearing of my remarks at this point is that the outlet of the burner must be kept clean, or the flow is being restricted and the candle power is affected. Thus, with a "C" burner it is absolutely essential that the gauze should be kept clean and periodically renewed, because after use the wire itself swells by oxidization and reduces the outlet area. This applies, of course, to all burners with gauze mixing-chambers, and especially to the Kern burner as regards cleaning only (not renewing, as it does not oxidize with its perforated inner cone), as, if this is dirty, it is equivalent to a reduced outlet.

We will now discuss our third heading—namely, mantles—which I have left to the last, because, though it is the most important, it will prove in practice to be the least offender, so far as loss of light is concerned, than either the gas supply or the burner; and if the two latter are performing their proper functions, the mantle will in most cases give no trouble. In other words, nine-tenths of the trouble experienced in lighting is not owing to the mantle—that is, except from breakage—but in nearly every case a reduction in light is due to a bad bunsen flame brought about either by dirty or inefficient burners or a faulty gas supply. I will now refer to a remark in the beginning of the paper regarding the hottest zone of a bunsen flame, as I wish to point out the vital importance of the mantle being absolutely immersed in this intense zone, and, to put this into practice, the mantle must fit the flame if good results are to be expected. If a mantle is too large in diameter for the flame, it only comes in contact partially with this intense zone, and the mantle is mostly on the extreme edge of the outer flame, where the latter is over-aërated, and where the temperature is considerably less than a little below the surface. As engineers and scientific men, you will all readily agree that if highly efficient results are demanded, conditions must be correct; and, as you do not expect your full yield of gas from a charge of coal if your retorts are not maintained at the right temperature, so you cannot expect the highest efficiency from a Welsbach mantle if it is not in contact with the hottest portion of a bunsen flame. The Kern burner, properly regulated, and fitted with a mantle of correct size, yields a result so far exceeding that given by any other low-pressure burner that the little extra care needed in maintaining it is amply repaid.

I would point out that whereas with an upright burner you make your mantle fit the flame yielded by the burner, with an inverted one, as at present made, you make the flame shape itself to the mantle; so that the inverted mantle is in control of the shape, and to some extent the size, of the flame, and there is therefore considerable latitude in both size and shape permissible with an inverted mantle which would be fatal in an upright one. Although, even here, the best results are, of course, obtained by a mantle properly proportioned in size and shape to the quantity of gas to be consumed, as a general remark one might add that when the mantle is giving bad results it is on account of the size being wrong in nearly all cases, and often because the diameter is too large and the mantle itself too long. In other words, if your mantle is on the small side, both in diameter and length, you are far more likely to get it immersed in the hottest zone of the flame, and get something approaching highest results, than if you have it too large.

This brings us to the effect brought about when the shape of the mantle alters by shrinking after being in use; and you will note that when a "C" mantle shrinks-in badly, the light is considerably reduced. This is due to the mantle shrinking to within the hyper-incandescent zone, and it now requires a flame of smaller diameter to fit it. It is, therefore, of first importance that mantles should be thoroughly seasoned in the process of manufacture; so that all the shrinking should take place in that process. For this reason, it is always far more economical to use the best quality Welsbach mantles than cheap imitations, which, in most cases, are imperfectly seasoned and soon fall off in light-giving power, mostly for the above reasons. When mantles were made on a cotton base, it was very difficult to complete this seasoning or shrinking process in the factory; but now that they are mostly made on a ramie thread base, the shape will stand throughout its life if the seasoning has been properly done.

The discussion of the paper it was arranged should be postponed to a future meeting.

REGISTER OF PATENTS.

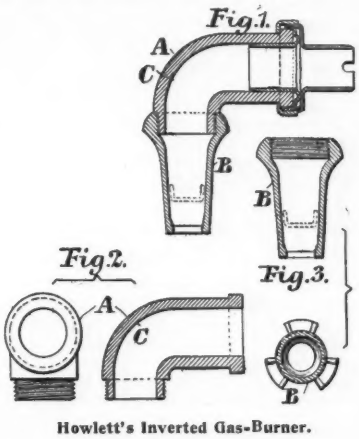
Inverted Incandescent Gas-Burner.

ROSE, A., and BELLAMY, W. (Howlett and Co.), of Birmingham.

No. 27,290; Dec. 15, 1908.

This burner is moulded in plastic clay in two parts, so as to enable the sides of the hole in the vertical part to be made to taper, and so facilitate the removal of the cores; and the two parts are fixed together and fired as one piece, so that they cannot be separated.

Fig. 1 is a sectional side elevation of the burner. Fig. 2 is an end elevation of the upper bent part. Fig. 3 shows the lower vertical part.



Howlett's Inverted Gas-Burner.

In order that the burner may be formed with the easy bend C and internally tapering nozzle part, the burner is moulded in the plastic state in two separate parts A and B; the division being just at the bottom of the bend, so that the part A constitutes the horizontal inlet with the bend C, and has a small spigot (or a socket) to receive the lower part B, which constitutes the nozzle and has the lateral projections to carry the mantle. The two parts A B may be fired independently of one another, and then connected by being screwed one within the other or by being merely pushed one within the other. When screwed, the screw threads are formed on the parts while they are in the green state. After the two parts have been connected, they are glazed and fired as one piece, so that they cannot be separated.

By moulding the burners in two pieces, the cores can readily be removed from both before they are fixed together.

Incandescence Mantles.

ZDANOWICH, J. O., of Knaresborough Place, S.W.

No. 27,755; Dec. 21, 1908.

The patentee remarks that the conversion into oxides of the salts (and particularly of the thorium nitrate) used in impregnating the fabric of incandescence mantles by the methods commonly employed—viz., incineration or treatment with ammonia—"produces a mantle of extreme fragility, due to the loosely adherent condition of the resultant oxides." For increasing the strength, hardness, and durability of mantles, it has been previously proposed, as is well known, to impregnate the fabric with a solution containing nitrate of aluminium and nitrate of magnesium, and to calcine the fabric before applying the incandescing material. It has also been suggested to moisten the heads of previously impregnated incandescence bodies with a solution containing these nitrates, so as to impart tenacity to the heads after the incineration of the incandescence bodies. But, according to this invention, the defect of fragility is eliminated or reduced to any desired extent by utilizing the known property of hydrated oxide of aluminium (or of certain other metals) of shrinking and hardening when converted into de-hydrated oxide by heating.

The cotton or other fabric, therefore, before impregnating with the salts used in the production of the incandescence medium—and after treatment with a solution of one or more salts of aluminium, magnesium, or equivalent metal—has the hydrated oxide or oxides precipitated *in situ* by any known means, after which the fabric is dried and subsequently treated with any suitable incandescing mixture. Alternatively, the reverse treatment may be adopted; the aluminium salt being applied and reduced after the fabric has been impregnated with the incandescing solution, and either before or after incineration.

The skeleton fabric thus constituted tends to shrink and harden on its conversion into de-hydrated oxide during the incineration process, and thereby neutralizes the expansion of the illuminating salts, and results in the production of a mantle "of an altogether stronger and tougher character than can be obtained in the ordinary way." Further, the strength of the mantle is no longer dependent on the uniformity of the thread of which the fabric is woven.

The salts which give the best results are said to be the nitrates or acetates of the earthy metals or of the rare earth metals, and, in particular, the nitrates or acetates of aluminium, magnesium, or beryllium, or a mixture of such nitrates or acetates. In practice, a 4 per cent. solution of nitrate or acetate of aluminium has been found completely satisfactory. "In no case should too dense a solution be used—10 per cent. being about the superior limit for aluminium salts."

In the case of fabrics impregnated with a nitrate solution, the hydrated oxide is usually precipitated by subjecting the impregnated fabric to the action of ammonia vapour. When the fabric has been

impregnated with acetate solution, the hydrated oxide is precipitated by subjecting the fabric to steam under pressure—about 10 lbs. above atmospheric pressure giving good results.

After treating the fabric as described, and before treating it with the incandescing medium, it may first be incinerated, and the skeleton of de-hydrated oxide of aluminium, or the like, so formed is then (or after being partially melted by subjecting it to a gradually increased and finally high temperature) immersed in, or otherwise saturated with, a solution of the incandescing salt or salts. After being dried, it is again subjected to a gradually increased heat (or otherwise treated, as, for example, by exposure to the action of ammonia vapour) to convert the salt into oxides.

Lighting and Extinguishing Gas-Burners.

CLERC, E., and BIDAULT, E., of Paris.

No. 4589; Feb. 24, 1909.

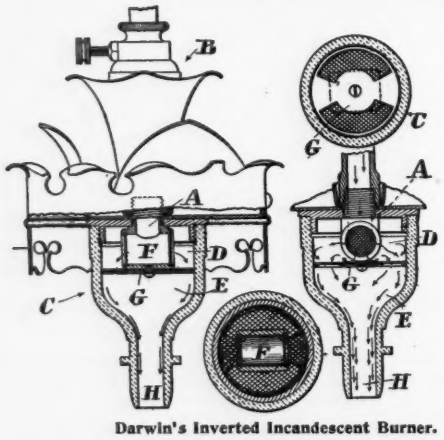
This invention relates to electrical devices for lighting and extinguishing gas illuminating appliances from a distance, in which a separate wire is provided for the three operations of opening the conduit, kindling, and extinction—the three wires being fed by a single source of electricity. The object of the invention is a switch of particular construction which enables the electric current to be passed at will through one of the three separate wires for: (1) Opening the gas-valve, (2) closing the gas-valve, and (3) operating any known kindling device.

Inverted Incandescent Gas-Burners.

DARWIN, H., of Gravelly Hill, near Birmingham.

No. 3572; Feb. 13, 1909.

This invention has reference to inverted incandescent gas-burners of the type in which the gas-and-air induction tube depends into, and has its discharging outlets arranged within, the interior of an expansion and mixing-chamber communicating with the burner-nozzle; the object aimed at being to "construct burners that will produce a flame of such form or character as will completely fill the interior of a large incandescent mantle (such as a 4-inch mantle), and thus enable the combustible mixture of gas and air to be most effectively and economically utilized without it being necessary to employ pressure gas."



Darwin's Inverted Incandescent Burner.

In the burner represented, the central induction tube A, which depends from a suitable air-regulator or bulb and gas-inlet fitting B, leads directly into the upper part of a mixing and expansion chamber C, which is partitioned off horizontally into two separate and superimposed compartments D E. The induction tube has attached to its lower end a double branched or inverted T-shaped delivery piece F, which is wholly within the upper compartment of the mixing-chamber, and is arranged so that its lateral extension branches or delivery passages lie in a horizontal plane, and have their outlets presented to the inner walls of the upper or primary compartment D of the mixing-chamber. The ends of the T-piece are fitted with discs of metallic gauze or other reticulated medium for initially atomizing the mixture as it passes through them into the compartment D. The two superimposed compartments are divided from one another by a horizontally-arranged diaphragm or partition G suspended within the part C so that it will divide the chamber off into two inter-communicating compartments, the lower one of which is gradually constricted into the burner tube or nozzle H.

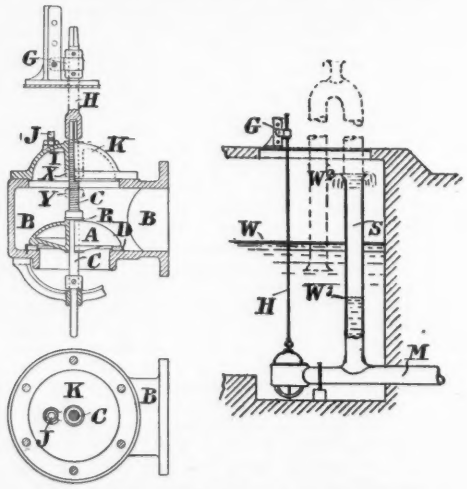
The diaphragm has large ports or apertures to admit of the mixture being drawn through them from the upper compartment to the lower one, and, moreover, it is preferably made of special form, so that it can co-operate with the branched delivery end of the induction tube in separating the mixture into separate streams. The diaphragm is so arranged below the delivery end of the induction tube that the openings come respectively on the opposite sides of the horizontal branches of the T-piece and out of the plane of the outlet ends of the branches, whereas the solid parts come in the same plane as the T-piece branches and constitute baffles, which prevent the gas and air issuing from the T-piece from being drawn directly downwards into the lower part of the mixing-chamber, and compel the mixture to impinge against the presented walls of the upper compartment and then to divide and pass laterally to the direction of its delivery from the branches to the partition openings on the opposite sides of the T-piece. The initially-formed mixture expands within the upper compartment, and is further atomized and incorporated by the gauze fittings of the separated openings, which co-operate with the separate discharge outlets of the induction tube in dividing the mixture into two distinct streams, which, although they converge on being drawn to the restricted part of the lower compartment and thence to the burner-nozzle, do not coalesce or merge, but remain distinct and separate until they are discharged at the nozzle into the interior of the mantle. Thus "when they issue from the nozzle, the streams are separated by an intervening air stratum, and when burnt within the mantle the resulting fish-tail flame completely fills the interior thereof and ensures the gas being utilized to the maximum of its illuminating efficiency."

Automatic Valves for Water-Reservoirs.

CRIPPS, F. S., of King William Street, E.C.

No. 4716; Feb. 26, 1909.

It is very usual, the patentee remarks, for high-level reservoirs to be fed by a single rising main from the pumping works, and which main, besides being the inlet to the reservoir, at the same time serves as the outlet or distributing main to the town or district supplied with water. His invention consists of a valve to be attached to the outlet branch from the reservoir, and so constructed that, as long as the pressure in the inlet or rising main exceeds the pressure due to the level of water in the reservoir, it remains closed, and will not allow water to pass out. But immediately the pressure of water in the rising main to which the outlet main is connected falls below the pressure of water in the reservoir, the valve opens automatically and allows water to pass out. The arrangement is more particularly applicable to cases where the inlet pipes are taken up to a higher level than the outlet, or where standpipes are adopted. In such cases where the water-level falls in the standpipes to a lower level than the water in the reservoir (due to the pumps stopping or any other cause), the valve opens automatically as stated.



Cripps' Automatic Valves for Water-Reservoirs.

The disc valve A is contained in the body B, and is free to rise and fall on a central spindle C when it is in its middle position of height. The valve opens inwardly—that is, A rises—when the pressure of the water outside B exceeds that of the pressure inside, by the pressure of water acting on the area of the valve. But the valve drops by its own weight and closes immediately the pressure inside exceeds that of the pressure outside the valve. To avoid damage from shock, as well as to make a sound joint, the valve drops on a rubber seat D. The central spindle is screwed in the upper portion which passes through the cover K, and can therefore be raised or lowered by turning. The valve is free to slide up and down the spindle; but collars are fixed in such positions on it that, when it is screwed right down, the valve is entirely shut, and will not allow water to pass either in or out—the valve being held down by the uppermost boss. When the spindle is raised to its full height, the lowermost boss suspends the valve fully open, so that it will allow water to pass either in or out of the reservoir.

In either of these two latter positions the valve acts as an ordinary stop or sluice valve; but when the spindle is raised to its middle position, so that the valve is free to either rise or fall, it will not admit water to the reservoir, but only act as an outlet. As shown, the valve is fixed completely closed, and prevents water passing either in or out of the reservoir through the valve. When fixed fully open, the spindle is raised so that the upper boss is in the position marked X. When, however, it is in the position marked Y, the valve is free to open inwards and discharge water from the reservoir when the head of water W in it is greater than that (such as W_1) in the rising main M to which the valve is attached. But if the pressure in the rising main (due to water being at, say, W_2) is greater than that due to the head of water in the reservoir, the valve closes automatically; thus forcing the water into the reservoir by the inlet standpipe S.

An indicator G is fixed on the spindle at the top of the reservoir (from which level it is worked) so as to show, by its height, which of the three positions the valve spindle C is placed in; and the spindle can be locked in either of the positions desired.

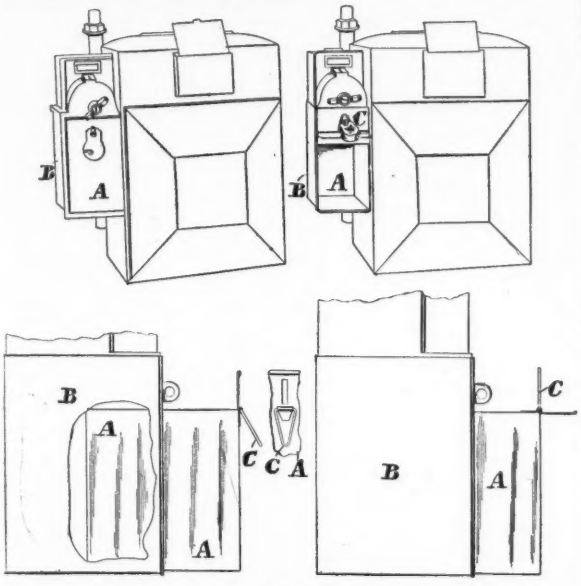
The valve A is so shaped or curved as to afford the least obstruction to the water flowing through. A rubber washer R (to deaden shock when the valve suddenly rises) is fitted with a loose metal washer under it, to prevent the valve being held up by suction of the rubber after pressure, and to enable the valve to part from the washer and drop by its own weight. The top of the valve cover K may be domed to form an air-chamber I, and from this chamber a small pipe J may be led to above the water-level in the reservoir, so as to admit of discharging any air from the main to which the valve is attached.

Money Boxes of Prepayment Gas-Meters.

YOUNG, A., and R. LAIDLAW AND SON, LIMITED, of Edinburgh.

No. 10,141 ; April 29, 1909.

This invention consists in so constructing and fixing the money-box that it can be used in the ordinary manner for the reception of coins when the meter is in proper and authorized use. But when, for example, a house is vacated for a time, and the meter is out of use, the collector, after removing the coins, replaces the money-box in such a position that no money can be passed into it from the prepayment attachment; and the fact of the money-box being empty is shown by the inside of the box being exposed to view. By an arrangement of the lock and attachment, the money-box can be locked in either position. "This idea of exposing the inside empty money-box to view when the meter is not in use, deters any person from tampering with the prepayment appliance and damaging it."



Young and Laidlaw's Prepayment Meter Money-Box.

Under one form, the money-box A is rectangular, with a correspondingly shaped container B open at the front of the meter and into which container the money-box is inserted; the front of the container being provided with a staple and the front of the money-box with a slot. The arrangement is such that when the meter is in authorized use, the staple protrudes through the slot of the money-box; and it is locked in position. When the box is not in use, it is withdrawn from its container, turned round, and the bottom of it presented to the open container; thus leaving the interior of the box exposed to view.

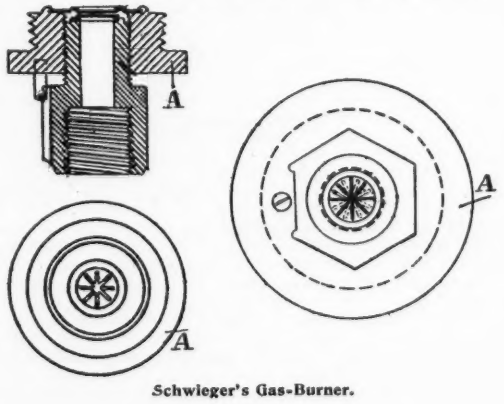
To effect the locking of the box A in this latter position the hasp C is provided, which is passed on to the staple and then padlocked—the empty money-box being thus retained in the receptacle.

Gas-Burners.

SCHWIEGER, A., of Berlin.

No. 14,323; June 18, 1909.

This burner is of the kind in which the gas supply is regulated by two diaphragms barring the passage and having coinciding slots the area of which is regulated by rotating the one diaphragm on the other.



Schwieger's Gas-Burner.

The diaphragms are provided with slots in the form of stars or double crosses, "so as to produce, in all positions of the diaphragms relative to each other, a gas-jet, of star-shaped and perfectly symmetrical cross-section, supplying to an incandescent body, placed on the burner, an equal amount of heat on all sides."

The nozzle is formed of two cylindrical bodies, one of which is nut-shaped and provided with an internal screw-thread by means of which it can be secured to the gas-pipe. Both diaphragms are provided with equal, symmetrical slots in the form of stars or double crosses. When the diaphragms are adjusted as shown in the enlarged bottom view, the slots only form a small central, star-shaped opening as an outlet for the gas; but by turning the part A, the rays of the star are gradually and symmetrically extended until the slots of both diaphragms register with one another, when the gas-outlet is at its maximum. The gas-outlet can thus be regulated in accordance with the pressure of the gas and the size of the incandescent body employed. A pin screwed in the part A serves to stop the movement of the latter at the maximum and minimum outlet of gas.

Bunsen Burner Connection for Gas-Stoves.

JESSEL, W., of Bradford.

No. 16,339; July 13, 1909.

This invention relates to a construction of an injector or nipple for a bunsen burner. It is formed at the front end of a screwed tube, and is provided with a nut so that, after it has been inserted into the mixing-chamber, it is held in position by the nut and a milled collar. This screwed nipple is provided at its rear end with an extension tube formed as described in patent No. 632 of 1903—viz., as a hollow thin tube with a shoulder towards its inner end. Over the flexible metallic tubing to be connected to the injector a metal collar or band is passed which approximately fits the tube; and below the band is wound asbestos fibre for a short distance, so that some of the fibres taking into the helical grooves of the tubing serve to hold the packing in position. The end of the tube, with its packing and collar, is then inserted into the metal tube, so that the end of it bears against the shoulder.

The novelty of this arrangement is said to be that the two parts are made in one instead of two separate parts as heretofore; and thus there is simplicity of construction, there is less chance of leakage, and an avoidance of friction, as the passage of the gas is direct from the flexible metallic tubing into the injector, and thus into the mixing-chamber of the stove.

APPLICATIONS FOR LETTERS PATENT.

30,238.—PARKINSON AND W. & B. COWAN, LTD., and LAYTON, A. E., "District pressure-governors for gas-distribution systems." Dec. 28.

30,244.—WILKINSON, H., and WIMHURST, F. L., "Anti-dip." Dec. 28.

30,271.—FLETCHER, RUSSELL, & CO., LTD., NEIL, J., FLETCHER, T. W., and RUSSELL, W. A., "Gas and water valve." Dec. 28.

30,304.—BECKMANN, C., "Gas-engines." Dec. 28.

30,362.—DUXBURY, T., and LEMMON, N. G., "Filling coke-skips." Dec. 29.

30,367.—LEWIS, J. P., & S., "Screw-down valves." Dec. 29.

30,378.—LELLIÉ, N., "Producer furnaces." Dec. 29.

30,383.—BRAZIER, J., and WATSON, H., "Lighting and extinguishing a system of gas-lamps at prearranged times from a given station." Dec. 29.

30,387.—KEITH, J. & G., "Controlling the supply of gas to burners." Dec. 29.

30,392.—PHILLIPS, F., and RICKCORD, R. V., "Automatically preventing the accidental escape of gas from a burner or other outlet." Dec. 29.

30,396.—PARKER, T., "Destructive distillation of coal." Dec. 29.

30,415.—CODY, S. F., "Fluid-tight joints." Dec. 29.

30,440.—BRISCOMBE, W., "Gas-engines." Dec. 30.

30,462.—BOAM, E., "Gas-heating apparatus." Dec. 30.

30,469.—FABRIS, G., and FREEMAN, W. A., "Illuminant signs." Dec. 30.

30,478.—FOSTER, C. E., "Pyrometers." Dec. 30.

30,563.—WELTI, C., "Valve-cocks." Dec. 31.

30,564.—BRITISH INCANDESCENT MANTLE WORKS, LTD., "Packing mantles." A communication from Deutsche Gasglühlicht Akt.-Ges. (Auerges.). Dec. 31.

30,581.—NÖRREGAARD, E. F., "Automatic gas-lighters." Dec. 31.

30,598.—HOLZWARTH, H., and JUNGHANS, E., "Gas-turbine plant." Dec. 31.

The Assessment of the Plymouth Gas-Works.—At the Plymouth Quarter Sessions last Friday, Mr. W. T. Lawrance mentioned to the Recorder the case of the Plymouth and Stonehouse Gaslight and Coke Company against the Guardians of the Poor of Plymouth—an appeal against the assessment of the Company's undertaking. The Guardians had received notice from the appellants that they did not intend to proceed with the appeal; and, under the circumstances, he had to ask that it might be dismissed with costs. Mr. Percival Clarke said he appeared for the Company, and it was a fact that they had given notice that they did not intend to proceed with the appeal. It was agreed that the costs should be taxed out of Court by consent; and the application was dismissed.

Torpoint District Council and the Water Engineer's Charges.—The failure of the Torpoint District Council to secure parliamentary approval of their scheme for the provision of an improved water supply was recalled last Thursday by the reading of a letter from Mr. J. Diggle, of Heywood, who was Engineer for the Council in connection with the scheme. There is still owing to Mr. Diggle a balance of his charges; and the suggestion had been made that he should accept a smaller sum in settlement. Mr. Diggle wrote that he thought such a proposal was altogether out of place. Members of the Council knew that he made an abatement of £500 in his charges at the time, and that the charges were not by any means proportionate to the vast amount of work he had done in connection with the unfortunate Bill. The Council were also indebted to him for agreeing to take part payment of his account in instalments, so as to assist the Council, and for accepting a much lower rate of interest than he obtained upon any other investments. Instead of asking for a reduction, the Council should have sent a cheque for the full amount with thanks. It was decided that the balance of the account, with interest, be paid forthwith.

LEGAL INTELLIGENCE.

THE CLAIM BY A FORMER GREENOCK GAS MANAGER.

Judgment by Lord Mackenzie.

On Thursday last, Lord Mackenzie, of the Court of Session in Scotland, issued his judgment in the action brought by Mr. W. Ewing, formerly Gas Manager in the employment of the Corporation of Greenock, now residing at Ardshiel, Stepps, near Glasgow, against the Corporation of Greenock. (See "JOURNAL," Vol. CVIII., pp. 548, 894.)

Lord MACKENZIE said: The pursuer was appointed and acted as Gas Manager to the Burgh of Greenock from Nov. 15, 1900, to Sept. 8, 1908. The action is brought for payment of £1645 8s., for work which pursuer says did not fall within the scope of his duties as Gas Manager. The work embraced reports on the proposed extensions of the existing plant; reports on tenders; preparation of plans and estimates; and the supervision of the erection of plant and machinery. This work, according to the pursuer's contention, was engineering work, which his salary did not cover. It is clear from the pursuer's application for the post of Gas Manager that he dwelt upon his qualifications as a Gas Engineer. In his letter of Sept. 8, 1900, in which he applied for the position of Manager, he set out his training and experience in gas engineering, which he stated gave him the utmost confidence in "the carrying on of all departments of gas engineering and management." His testimonials bore this out. The letter of application concluded: "I have much pleasure in offering my services, with remuneration according to working results, or at the salary offered." He was appointed Gas Manager at a salary of £400, with house rent free. There can be no doubt that his qualifications for engineering work influenced the Committee in giving him the appointment.

The pursuer had, previous to 1900, been Gas Manager at Hamilton, where he had given his engineering skill for a salary which was £150 at first, and had risen to £275. He had also received an honorarium in connection with certain extensions. There was this difference—that at Hamilton a list of the pursuer's duties was drawn up; at Greenock, it was not. The pursuer's predecessor at Greenock was Mr. Stewart; and in his evidence Mr. Ewing admits that he knew that Mr. Stewart, in November, 1900, was Manager and Engineer with a salary of £400, with an allowance for a house. Mr. Stewart had been in the service ever since 1866; and special arrangements were made with him on the completion of his term of office. Mr. Chalmers, who was appointed to succeed him, never did so, on account of ill-health. It is proved that when, in 1871-73, the site of the gas-works was changed, Mr. Stewart, by arrangement beforehand, received a payment of £600, which included attendance in London. Since that date, he received nothing but his salary, though there were extensions at the works costing some £15,000.

In my opinion, the pursuer's understanding, when he got the appointment, was that he would, as Gas Manager, have to do engineering work. He seems immediately after his appointment to have assumed the title of Engineer and Manager. He had order forms printed (which were for general business, not merely for extensions), and note paper with "Engineer and Manager" printed on them. "Engineer" was put on the office door, as well as on a rubber-stamp for use in the Corporation business. The pursuer's own view of his position is to be found in an application he sent in for an appointment at Nottingham in 1902, in which he stated: "At the latter end of 1900, I was appointed Engineer and Manager of the Greenock Corporation Gas Department." This appears to me to prove, out of the pursuer's own mouth, that he got one combined appointment. The justice of this view is strongly supported by the consideration that there is no separate and special qualification for a Gas Engineer as distinguished from a Gas Manager. In deciding to advertise for a Gas Manager, the Committee at Greenock determined to make the range of choice as wide as possible. Some gas managers have more engineering skill, some less. Other things being equal, the candidate who has the engineering skill in addition to the other qualities necessary, will have the preference. In the specifications prepared by the pursuer, a uniform supervision clause was inserted in these terms: "On behalf of the Corporation, the supervision will be done by the Engineer and Manager of the works, who is referred to in this specification as the Engineer, or any qualified person he may appoint." This does not bear out the pursuer's contention that he regarded his position as Engineer as separate from his position as Manager. The minutes of the Gas Committee, copies of which the pursuer regularly received, always refer to him as Manager. His appointment was annually renewed in similar terms; and the pocket-book which he received each year from the Corporation had his name and office stamped on it: "William Ewing, Gas Manager." In carrying out any instructions he received, Mr. Ewing used the office staff, paper, and block plans, which indicate that he thought he was dealing with an office matter. He kept no separate notes to enable him to make the present claim. He resigned office in September, 1908, and had to get the Corporation minutes and accounts to enable him to make up his claim, which he sent in on Dec. 24 of that year.

The truth is that the present claim was an after-thought. There is nothing in writing about it until after the pursuer's resignation; and I am of opinion that the pursuer has entirely failed to prove that he ever, during the period of his employment, brought to the knowledge of anyone representing the Corporation that he intended to make any such claim. Unless it was an after-thought, there is no sufficient explanation why Mr. Ewing made no provision for his fees either in the annual estimates which were prepared by him of the outlays for his department, or in the statement of expenditure for the past year. He says it was because the Town Clerk advised him to wait till the work was completed. The Town Clerk denies any such conversation; and it is not proved it ever took place. Even if it did, the pursuer does not say it was until 1905, which leaves no reason for omitting the charges from 1902 to 1905. In several respects the present case is much weaker for the pursuer than that of *Machison v. Burgh of Dundee* in 1909. A marked difference is that here all the defence witnesses clearly understood they were getting the pursuer's engineering services for the salary they were paying him. They had good grounds for this, because, according to their view, the pursuer was just taking up and continuing at the same salary the work that Mr. Stewart was ceasing to do. It is clear from the correspondence with Mr. Stewart that the Corporation never contemplated appointing a Manager at £400 a year, and appointing an Engineer as well. There is nothing in the estimates to suggest they had any doubt about the matter.

The pursuer's case is made to rest largely upon evidence of what is said to be general practice. After considering the evidence, I fail to see that the pursuer has adduced any instance of a corporation employee who has been held entitled (in the absence of special contract), as matter of right, to special remuneration for the extension of gas-works under his direction and supervision. The evidence falls under one or other of two categories—viz., cases of (1) special contract or (2) honorarium. No doubt in theory the evidence of some of the witnesses is favourable to the pursuer; but their experience does not support it. I am of opinion that there was no such distinction in the case of the pursuer as he seeks to draw between the duties of a Gas Manager and a Gas Engineer. In my opinion, all the work he did was regarded by both himself and his employers as falling within his contract to act as Manager, and that it did fall within his contract and was covered by his salary. It is not necessary to express an opinion on any general question. In my opinion, the case should be decided upon the true meaning and intention of the parties to this particular contract.

The pursuer attempted to make a case of special employment as Engineer. The terms of the agreement on this point are to be contrasted with the pursuer's evidence. He avers that he "received defenders' instructions to act as their Consulting and Resident Engineer in Mr. Stewart's absence." It now appears from the pursuer's evidence that these were verbal instructions from the witness Campbell, who was then Convener of the Gas Committee. The pursuer was asked: "Did he say anything to you about your being Consulting Resident Engineer?" His answer was: "No." Mr. Campbell's account of it is that the pursuer just stepped into the shoes of Mr. Stewart in regard to the work that was then in progress; that he may have told him to look after the erection of West's machinery (this was to substitute mechanical for hand stoking), in Mr. Stewart's place, but that he would not regard this as extraordinary work. The pursuer's case as to an interim appointment, in my opinion, fails.

The case for a permanent appointment rests on the following minutes: The minute of Oct. 8, 1901, which is in these terms: "Reference was made to the quality of gas reported; and it was agreed that the Gas Manager be instructed to report to a future meeting what is necessary to enable him to supply an improved and higher quality of gas. The Manager was also instructed to report what he considers necessary to be done to put the works into proper condition." The admission in one of the answers is to be read along with the terms of the minute. The report is dated Nov. 25, 1901. It was submitted at a meeting of the Committee on Nov. 25, and ordered to be printed and circulated. The minute of Dec. 17, 1901, says that it was resolved, with reference to the non-working of the stoking machinery at Inchgreen, that the Manager be asked forthwith to report on the best method of utilizing the works as they then were, and the cost thereof. This is the foundation for the report dated Jan. 7, 1902, which is an exhaustive one. Now, in both minutes it is the Gas Manager who is instructed; and the matter is dealt with as a Gas Manager's affair. There is nothing in the minutes about the appointment of an outside Engineer, or that any appointment as Engineer was ever conferred on the pursuer. The minutes do not bear out the pursuer's account in his evidence. There is nothing to show that the Committee had a large scheme in their minds, and that the pursuer was selected to carry it out in preference to an outside Engineer. The way in which the matter came up was on account of complaints as to the quality of the gas; and the remit was made to the Manager in consequence.

The pursuer did not suggest at the time that he was entitled to any extra remuneration. In the latter report, he proposed an elaborate series of works, to cost £45,000. This, as the witness Campbell says, the Committee did not take seriously, because it was outside their capability. They had not asked or expected any report of this character; and as regarded the detail of the various schemes, this was a matter which emanated from the pursuer himself. Against the pursuer's contention that he was from October, 1901, acting as Engineer, as distinguished from Manager, is the fact that in November, 1901, he admits he got his re-appointment as Manager without any reference to a separate appointment as Engineer. Nor is there sufficient reason for holding that the pursuer is entitled to extra remuneration on the ground of implied contract. The work was remitted to him as Manager, and performed by him without protest or claim during the whole course of his employment. There was clearly an *onus* upon him to make it known to his employers, if he intended to treat the work as of an extraordinary character.

It is unnecessary to enter into the details of the pursuer's claim as stated on the record or in the account he sent the defenders after he left their service, and which has been produced by them. The items, so far as insisted in, are open to criticism in many respects. I do not doubt that the pursuer spent time and trouble upon the reports, as well as upon other matters for which he now seeks to be paid. I am of opinion that the understanding, both of the pursuer and the defenders, was that this work was covered by his salary. If this was not the pursuer's view, he has only himself to blame for not distinctly intimating to his employers, when he was instructed to do the work, that it did not fall within his duties as Manager, and that he would have to be paid extra for it.

I think the pursuer's case fails. The defenders will be assoilzied, with expenses.

The Swansea Water and Sewers Committee have recommended the acceptance of the tender of Messrs. Moss and Co., of Loughborough, at £18,700, for the construction of a service reservoir at Morriston. The recommendation is subject to the insertion of a clause in the contract providing that certain specified material shall be of British manufacture.

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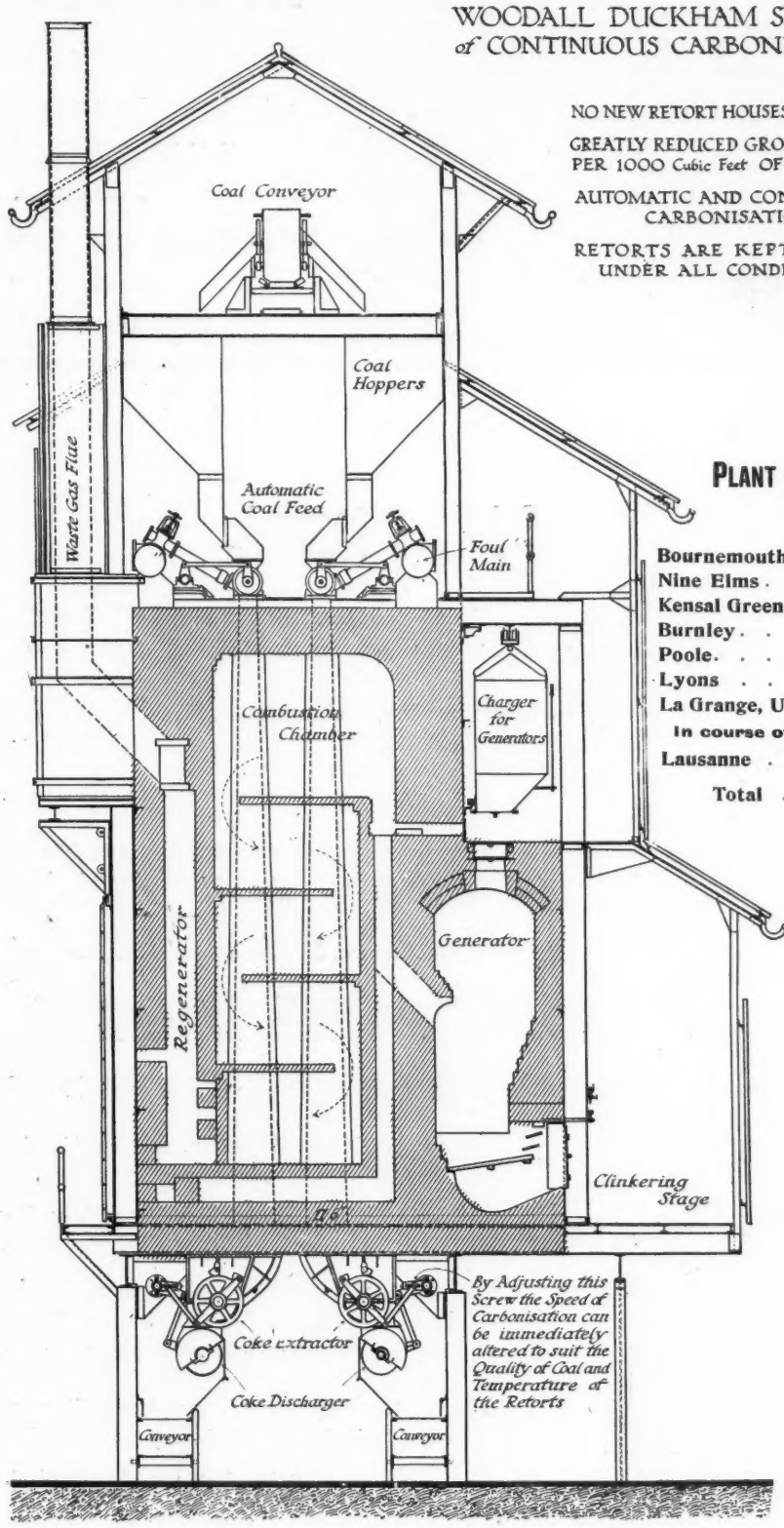

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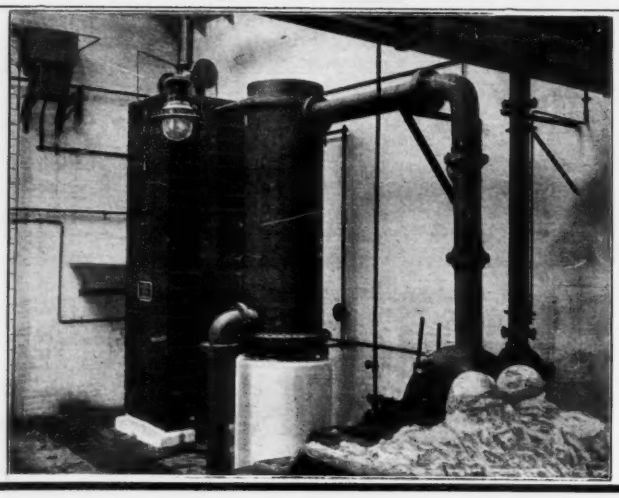

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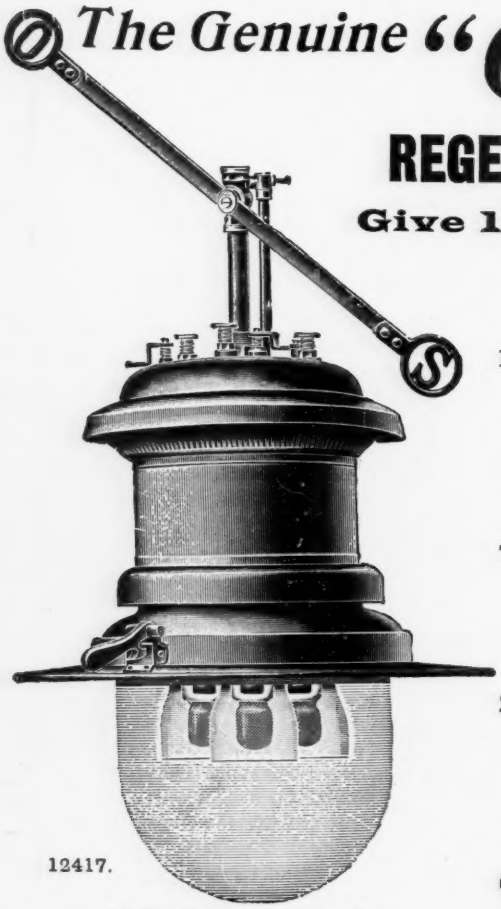

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CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

German v. English Retorts.

SIR,—With regard to the correspondence which has recently appeared in your columns on the above question, it is somewhat disappointing that no particulars have been given as to the work done by German retorts, as such information would be most useful in making comparison with our everyday work with retorts of English make.

So much has been said in favour of German retorts that I should like, in justice to some of the British makers of retorts, to give you my own experiences with the latter. At the same time, the discussion will undoubtedly have a bracing effect on the English makers; and those firms who have exercised much care in the manufacture of retorts in the past, will no doubt be spurred on to greater efforts in the future.

We intend pulling out and resetting five beds of retorts towards the end of March and early in April. These beds are fired on the Klönne regenerative system, and consist of eight retorts per bed—each retort being 22 inches by 16 inches by 20 feet long, of Stourbridge make—and were put in in the early spring of 1905. Since that time these retorts have been at work during 1467 days, and have carbonized 13 tons of coal per bed per 24 hours in 4 hours 48 minutes charges, or 1⅝ tons per retort per 24 hours. Thus each retort during its lifetime has carbonized 2384 tons of coal. The gas made per ton of coal by these beds, during each of the five years, is as follows: 1905, 11,920 c. ft.; 1906, 12,198 c. ft.; 1907, 12,307 c. ft.; 1908, 12,292 c. ft.; 1909, 12,376 c. ft. —an average of 12,219, c. ft. per ton of coal carbonized × 2384 tons= 29,130,096 c. ft. of gas made per retort during its lifetime.

One is well aware that retorts can be made to last almost any length of time—depending, of course, on the temperature at which they are worked, and the amount of patching and mending done to them. During the five years the above retorts have been at work, a total sum of only £35 has been spent on material for repairing them, which proves that in this case at any rate the original retort has not been "mended and patched out of existence."

Then as to the temperature at which the retorts have been worked. The coal carbonized at Scarborough is a mixture of good all-round "South Yorkshire," screened through a ¾-inch mesh. But, as it is of a friable nature, a good deal of fine powdery coal is mixed with the rough. As, however, the retorts referred to have been working off 6½ cwt. charges in 4 hours 48 minutes, and the gas has been made at the average rate of 12,219 cubic feet per ton of coal carbonized, it shows they were worked at a high (rather than medium) temperature.

In the "JOURNAL" for Nov. 9 last I read with great interest the remarks by Herr Körting, of Berlin; and I can thoroughly endorse all his statements in relation to horizontals, as the life of a retort depends not only on the quality of the material, but very much indeed on the efficient construction of the furnace and combustion chamber arches, as well as in the regularity of the heating.

As a further proof of the importance of efficiency in workmanship, I may give as an instance the relining at the bottom of the generators in our carburetted water-gas plant, where, as is well known, a very high temperature obtains. Originally, the brickwork in the bottom part of the generators was burnt through after about 600 working hours, which necessitated relining. On looking into the matter, it was found to be due to the workmanship in the setting of the blocks. Now, however, by utilizing experienced labour, and with the same class of material (Stourbridge make) from the same firm as formerly, and working under exactly similar conditions, the generators run for 2200 hours before being burnt through, or nearly four times as long—thus showing the importance of having fire-brick work well executed.

It, therefore, behoves gas engineers to see that efficient workmanship is employed in the setting of the retorts, and the building of the furnace arches, and combustion chambers, as unless such work is properly executed, the quality of the retort material avails little.

Scarborough, Jan. 6, 1910. ALEXANDER ALLAN.

Coulson's Tar Patent.

SIR,—My attention has just been drawn to a letter appearing in the "JOURNAL" for the 28th ult., with reference to my patent of 1909.

In reply to same, I beg to say that if your correspondent will look carefully through the specification given in a previous issue, he will find that the small quantity of acid is added to the semi-pitch left in the still, after taking off some portion of the volatile matter, in order to make same sufficiently hard to admit of its being readily transported. The value of the small quantity of acid used is shown by the fact that the pitch made by my process contains about 73 per cent. of volatile matter, against 47 to 64 per cent. in the ordinary tar residue or pitch as now sold.

As quite 90 per cent. of the pitch now produced is used in the manufacture of briquette fuel, this product will be sold for that purpose, for which it is specially suitable—in fact, a briquette manufacturer has already stated that he is willing to take a daily supply at a price leaving a good margin of profit.

Sheffield, Jan. 6, 1910. J. G. COULSON.

Gas-Stokers' Wages at Neath.—At a meeting of the Neath Town Council a few days ago, the question of the wages paid to the gas stokers came up for discussion. Mr. Victor Morgan, of the Gas Workers' Union, said that the Neath men received less than men in any other town in South Wales, and their work was much harder. Alderman Hopkin Morgan, however, replied that the Committee were advised that the work was not harder; while Mr. R. A. Browning, the Gas Engineer, stated that the stokers were better paid than men in any other South Wales town. A recommendation refusing an increase was adopted.

PARLIAMENTARY INTELLIGENCE.

PROPOSED EXPENDITURE ON GAS AND WATER WORKS.

According to the plans and estimates deposited in the Private Bill Office, under the Standing Orders, on behalf of the various gas and water undertakings promoting Bills in the forthcoming session, the following expenditure on works is proposed under the powers sought. The names in parentheses are those of the engineers connected with the schemes.

	Total.
Aberdeen Corporation, for water (Messrs. Alexander Binnie, Son, and Deacon, and Messrs. T. & C. Hawksley)	£1,396,000
Abertillery and District Water Board (Mr. Baldwin Latham), exclusive of £100,707 for reservoir, draw-off works, catchwater, and £95,845 for trunk mains	247,000
Cambridge University and Town Water Company (Messrs. T. & C. Hawksley)	167,500
Clydebank and District Water Trustees (Mr. J. Stuart)	61,770
East Grinstead Gas and Water Company (Mr. W. Vaux Graham)	19,000
Egremont Urban District Council, for gas (Messrs. T. Newbigging and Son)	14,820
Exmouth Urban District Council, for Water (Messrs. G. H. Hill and Sons), exclusive of £3252 for pumping machinery and £10,519 for mains	18,012
Fraserburgh Corporation, for water (Messrs. W. Allan Carter and W. Alexander)	45,870
Fylde Water Board (Mr. G. Cook), exclusive of £91,500 for reservoir and equilibrium basin	212,000
Hastings Corporation, for water (Mr. P. H. Palmer)	128,486
Hoyland Nether Urban District Council, for gas (Messrs. T. Newbigging and Son)	8,000
Little Hulton Urban District Council, for gas (Mr. W. Newbigging)	2000
Maltby and Tickhall, proposed Company, for water (Messrs. Fairbank and Son)	6,205
Middlesborough Corporation, for gas mains, meters, &c. (Mr. D. Terrace)	50,000
Montrose Corporation, for water (Mr. J. B. Bennett)	24,390
Mountain Ash Urban District Council, for water (Mr. W. Fox)	74,765
Pontypridd and Rhondda Joint Water Board (Messrs. G. H. Hill and Sons), exclusive of £200,000 for reservoir and £123,472 for trunk mains	407,000
South Hants Water Company (Mr. W. Matthews)	16,500
Staffordshire Potteries Water Company (Mr. G. B. H. Soane)	198,033
Thorne and District proposed Company, for water (Messrs. Fairbank and Sons)	12,495
Wellsand Fakenham, proposed Company, for water (Mr. G. H. Perryn)	6,960
Whitland, proposed Company, for water and gas (Mr. B. T. Rees)	3,278

CAMBRIDGE AND THE STANDARD BURNER BILL.

A Special Meeting of the Cambridge Town Council has been held to consider a report of the Lighting Committee with reference to the Gas Companies Standard Burner Bill which the Cambridge University and Town Gaslight Company, in conjunction with other Companies, are promoting in Parliament.

The Committee reported that the Town Clerk had been in communication with the authorities of other towns interested in the Bill; and after considering the information received from them, the Committee were of opinion that it should be made quite clear that the adoption of the proposed new burner would not in any way result in the Company being able to supply gas of a lower illuminating power than that of 16 candles under the present test, and that they should be asked to give an undertaking to insert a clause in the Bill to secure this object. The Committee were further of opinion that the Company should be asked to consent to clauses being inserted in the Bill providing: (1) That a standard calorific power of gas supplied by the Company shall be fixed, as has been done in section 39 (1) of the Gaslight and Coke Company's Act, 1909; (2) that the prescribed method and apparatus for testing the illuminating and calorific power of the gas shall be in accordance with the notification of the Metropolitan Gas Referees as issued by them from time to time; and (3) that the time for making official tests of at any rate the calorific power of the gas shall be extended to any time of the day or night, as provided for by section 18 (1) of the last mentioned Act. If the Company were unwilling to do this, the Committee were of opinion that steps should be taken to oppose the Bill, with a view to obtain the insertion therein of clauses for carrying out these objects, and also for limiting the pressure and for securing the purity of the gas; and they therefore recommended that, in the event of the Company refusing to insert such clauses, the Town Clerk be authorized to affix the Corporate seal to a petition against the Bill. The Committee further recommended that in this event they should be empowered to settle with the Town Clerk the exact form of the petition.

The adoption of the report having been moved and seconded,

Mr. PURVIS said he thought the matter required further consideration in view of the importance of securing gas as free as possible from all

sulphur compounds. There was no doubt that sulphur compounds, besides being injurious from a health point of view, were also injurious to furniture, books, pictures, &c. It was difficult to remove all the sulphur compounds; but at the same time he did not think this released any company from the responsibility of giving a town a gas that was free as possible from all sulphur compounds. It was for this purpose he suggested either that an amendment should be put in the resolution or that the Committee should further discuss the matter before action was taken. He moved the addition of a clause providing for the exclusion of sulphur compounds from the gas.

Dr. DALTON remarked that the Public Health Committee considered this matter two or three months ago somewhat exhaustively; and they came to the conclusion suggested by Mr. Purvis.

The mover and seconder intimated that they were willing to accept the amendment.

Dr. DUCKWORTH said he thought the Bill only concerned a new burner; and he did not quite see the connection between this matter and the question of sulphur compounds. Was it proposed to take advantage of the new burner being asked for to secure greater purity for the gas?

Mr. INNES (who had moved the adoption of the report) explained that the Gas Company were proposing to have a new standard burner established, which would enable them to supply gas of a different quality in some respects, and differently tested, from the gas they were at present supplying. If they obtained this power to supply a different quality of gas, they should also ensure an improvement in the supply in other respects.

Mr. LINSEY remarked that a considerable sum of money was spent some time ago on apparatus for testing the illuminating power and pressure, and also for testing the amount of sulphur contained in the gas. If this apparatus was on their own premises, and they had control of it, what had they to complain of? He would like to know if their official tester had gone on without testing the gas for those ingredients which were so detrimental to the public health. Had they been waiting for the institution of this new burner to find all this out, when the apparatus would tell them all they wanted to know?

Alderman CAMPKIN said they had tested the gas from time to time; but, when they had made certain discoveries, they had no power to order the removal of the sulphur.

The TOWN CLERK explained that, under the original Act, the gas supplied by the Company was not to contain more than 4 grains of ammonia, or more than 20 grains of sulphur in any form, in 100 cubic feet. Later the condition with regard to sulphur was removed by the Sulphur Restrictions Act; so that, though the Council might search for sulphur, there was no remedy when they found it.

Mr. BLACK said there was something more important behind this question than simply a new burner to give greater illuminating power. It was quite clear that there were adulterations in the gas that were dangerous to health; and, if by combining with other authorities, they could compel the gas companies in the new Bill to supply a purer gas than they did at present, they were in duty bound to unite with others to safeguard the health and interests of the people of Cambridge.

The report, with the amendment proposed by Mr. Purvis, was adopted.

New Joint Stock Companies.—Frame Light, Limited, has been registered with a capital of £1500, in £1 shares, to carry on the business of merchants, manufacturers, and dealers in incandescent gas and other species or systems of artificial lighting and heating, with all appurtenances and accessories, &c. The Merlin Gas and Engineering Company, Limited, has been registered with a capital of £1000, in £1 shares, to carry on business as gas engineers, founders, &c.

Heacham Water Supply.—An inquiry directed by the Local Government Board was held in the Town Hall, King's Lynn, last Wednesday, by Mr. F. J. Willis, one of the Board's Inspectors, respecting an application made by the Urban District Council of Hunstanton for a Provisional Order, under the Public Health Act, 1875, to partially alter, or amend, the New Hunstanton Water and Gas Act, 1897, so as (1) to repeal the words "and every such agreement shall be by virtue of this Act determinable by the District Council on one month's notice in writing" contained in section 19 of the Local Act; and (2) to empower the Urban and Rural District Councils of Docking to enter into and carry into effect an agreement or agreements for providing a supply of water in bulk or otherwise for the parish of Heacham. Negotiations had been in progress for some time; and at a recent conference between the two Councils, at which a representative of the Local Government Board was present, it was agreed to take steps to eliminate the power of determining any agreement at a month's or longer notice. There was no opposition to the application.

Gas Accounts of the Pontefract Corporation.—Arising out of the recent discrepancies in the Gas Department of the Pontefract Corporation, mentioned in the "JOURNAL" for the 28th ult. (p. 903)—in connection with which the accounting clerk, George Hepworth, was remanded on bail on Monday last week for another fortnight—a Special Sub-Committee, appointed to inquire into the system of book-keeping at the gas-works, and into other matters relating thereto, presented their report to the Corporation last Wednesday. They report that a proper system of gas-works accounts does not exist; that the Manager is not entirely free from responsibility in the matter, particularly with regard to the undue detention at the gas-works of the receipts from slot-meters; and that the Borough Accountants have allowed, and have apparently been satisfied with, the present unsatisfactory system of accounts, and with an improper method of dealing with the receipts at the gas-works, and have neglected to exercise the requisite care and supervision in regard to transactions which belong to their department. The Committee recommend that an expert accountant should be called in to establish an efficient system of accounts; that a gas expert be requested to report upon the condition of the plant, the method of working, the cost of gas production, and generally on all other matters relating to the conduct of the works; and that a monthly report be presented to the Gas Committee by the Manager, showing all the important facts of the month's working. The whole of the proposals have been referred to a Committee of the entire Council.

MISCELLANEOUS NEWS.

PRESTATYN GAS TRANSFER ARBITRATION.

The Sum Awarded.

Sir Hugh Owen, the Arbitrator in this matter, has made his award. He fixes at £14,170 the price to be paid by the Prestatyn District Council to Lady M'Laren for the local gas undertaking; and, as arranged during the proceedings, as reported in the "JOURNAL" for the 21st ult. (p. 826), they will bear the costs of the arbitration.

BUENOS AYRES AND ITS GAS SUPPLY.

The Amalgamation of the Companies.

Meetings of the Shareholders of the Buenos Ayres (New), the River Plate, and the Primitiva Gas Companies were held last Thursday for the purpose of confirming the resolutions, providing for the amalgamation of the three concerns, as duly passed at the meetings on the 21st ult., and published in the succeeding issue of the "JOURNAL." The whole scheme was then set out.

At the confirmatory meeting of the Buenos Ayres (New) Gas Company, Mr. J. C. im Thurn presided. The Solicitor merely read the resolutions; and, on the proposition of the Chairman, seconded by Mr. Ross Pinsent, they were confirmed.

The River Plate Gas Company's meeting was presided over by Mr. Albert E. Bowen. The four resolutions which were passed at the previous meeting were taken as read; and, on the motion of the Chairman, seconded by Mr. Campbell P. Ogilvie, they were straightaway confirmed.

Presiding over the meeting of the Primitiva Gas and Electric Lighting Company of Buenos Ayres, Mr. H. E. Jones pointed out that the business to be transacted was purely formal; and he took it that those present had satisfied themselves, by looking into the various documents, as to the advisability of agreeing to the resolutions which were passed at the preliminary meeting. He would therefore not waste their time by making a speech, but would at once move the confirmation of the various resolutions, which had been read by the Secretary. He then put the four resolutions separately—the adoption of each one being seconded by Mr. C. H. Sanford—and they were all confirmed without comment.

GAS SUPPLY OF GENEVA.

Working in 1908.

According to the report of the Municipal Council of Geneva for the year 1908, in which is recorded the progress of the gas undertaking, under the management of M. Des Gouttes, the quantity of gas produced in the twelve months was 11,022,780 cubic metres, about 389 million cubic feet, or 2·672 per cent. more than in the preceding year. The quantity consumed and unaccounted for, however, was 11,026,430 cubic metres (nearly 389¼ million cubic feet), or 2·742 per cent. in advance of 1907. The following table shows how the gas was disposed of:—

	Cubic Metres.		Per Cent.
Consumed by meter	9,267,810	..	84·05
Fixed burners, for stair and yard lighting	437,447	..	3·97
Public lamps	800,862	..	7·26
Works and offices, &c.	112,493	..	1·02
Unaccounted for (3·7 per cent. of the consumption, against 5·3 per cent. in 1907)	407,818	..	3·70
Total	11,026,430	..	100·00

The quantities of coal and water gas were 9·80 and 1·22 million cubic metres respectively; the proportion of water gas in the mixture being 11·06 per cent. The bulk of coal carbonized was 32,585,540 kilos., or 32,585½ metric tons; and it cost, delivered on the works, about 35 frs. per ton, or nearly 3 frs. more than in 1907. In addition to the ordinary coal, some of which came from the Wearmouth Colliery, *vid* Marseilles, 60 tons of cannel were used. For making water gas, 540,075 kilos. of oil and 700,090 kilos. of large coke were employed; the oil coming from Galicia. In the naphthalene washer, which has been in operation since July, 1905, 42,840 kilos. of anthracene oil were used; and the report states that deposits of naphthalene in the mains continue to decrease. The production of residuals was as follows: Coke, 23,573,030 kilos.; tar, 1,776,902 kilos.; concentrated ammoniacal liquor, 258,500 kilos. The coke employed for heating the retorts was 18·08 per cent. of the coal carbonized; the production of tar was 5·45 per cent.; and the liquor contained an average of 22 per cent. of ammonia.

The total number of consumers on Dec. 31, 1908, was 26,748 by meter (26,643 of them taking less than 106,000 cubic feet of gas in the year) and 1303 by fixed burners—together 28,051, as compared with 26,996, or 3·91 per cent. more than at the end of 1907. The number of meters on hire was 26,437; but the total number fixed was 27,467, representing 188,806 burners. They were divided as follows: Wet, 18,887; duplex, 6618; dry, 1955; prepayment, 7. The number of cooking-stoves sold in 1908 was 1891, compared with 1671 and 1640 in the two preceding years. Since 1899, there have been 13,901 stoves placed; but since 1886, when the Municipality introduced the system of free fixing, the number sold has been 35,800. The quantity of gas consumed for motive power is not large; there having been only 14 gas-engines at work during 1908, and one of these was taken off by the close of the year. The number of public lamps in use at the end of 1908 was 2763—an increase of 69. They are nearly all fitted with incandescent

burners, for which 18,297 mantles and 4043 chimneys were used; being an average of 6·62 mantles and 1·46 chimneys per lamp. The total length of mains at the end of 1908 was 227,084 metres, or 141 miles.

The sale of gas to private consumers produced 2,113,106 frs. (£84,524); and to the Municipality, for public lighting, 115,600 frs. (£4624)—being increases of 99,200 frs. (£3968) and 2170 frs. (£87) respectively. The 115,600 frs. includes a sum of 48,100 frs. (£1924) paid for the maintenance of the incandescent lamps and burners. Coke brought in 456,151 frs. (£18,246); tar, 52,302 frs. (£2092); ammoniacal liquor, 50,575 frs. (£2023). The expenses of working and administration came to 1,857,551 frs. (£74,302); and the revenue other than that derived from the sale of gas, to 636,709 frs. (£25,468); leaving the net expenses 1,220,842 frs. (£48,834), being 11·62 c. per cubic metre, or not quite 2s. 7d. per 1000 cubic feet, of gas sold.

ELECTRIC LIGHTING IN DUBLIN.

Increase in Charge to Cover Losses.

At the Meeting of the Dublin Corporation on Monday last week, the Standing Orders were suspended to allow of the discussion of the report of the Electric Lighting Committee, already noticed (*ante*, p. 53), in reference to the proposed increase in the charge for current.

The Chairman of the Electric Lighting Committee (Mr. Lennon), in moving the adoption of the report, said that, in the opinion of the Committee, it was absolutely necessary to increase the price of electricity if the undertaking was to pay. The Committee could do no more than they had done. Mr. W. M'Carthy, in seconding the motion, said that, as a member of the Committee, he had up to the present always voted against any proposed increase. He had gone very carefully into the matter, however, and had come to the conclusion that it was absolutely impossible that they could go on increasing their indebtedness in this department of the Corporation. It was urgently necessary to put a small increase on the rates. Alderman Bergin said he had opposed a similar report last year in the hope that it was only a temporary increase; but as he found it had not been met by an increase of business, he felt compelled to vote for the recommendations in the report. He thought it would be well that it should be made clear to the public that the increased rate of 10 per cent. would be only for a temporary period—say, for twelve months. Mr. Ireland said the present was the third time this matter had been before the Council; and he had opposed it on business lines from the very outset. There was no reason why the electric light undertaking should not pay at the existing charges and be a success, if it was properly managed. In the report, not a word was said about working with economy and the better management of the concern. It simply said that they could not go on as they were going, and that 10 per cent. should be added to the charges. The speaker cited, as an instance of laxity in management, the fact that bills to the amount of £2500 were outstanding. Seeing that the price of gas was coming down from 3s. 7d. to 3s. 4d., and that there was an improvement in its illuminating power, he asked how they could expect to get additional consumers of electric current at increased rates. The way to make any concern pay was to see that it was worked with economy; and this, he submitted, had not been done in the present case. Alderman Farrell said he was in favour of the report, on condition that the management of the undertaking would be investigated. Alderman Birney moved, as an amendment, that the report be referred to a Committee of the Whole House. Alderman Kelly, in seconding, said there were serious statements in regard to the management of the concern; and it should be the work of the Council to investigate the management of the undertaking rather than mulct the consumers. Mr. Sherlock expressed the hope that the amendment would be rejected. He said the ratepayers should not be asked to put their hands into their pockets to give light for nothing to the comparatively few who used it. The matter should be dealt with in a business-like way. On a division, the amendment was rejected; and the original motion, amended as suggested by Alderman Bergin, was carried by a large majority.

PROFIT-SHARING IN THE DARTFORD GAS COMPANY.

An addition has lately been made to the list of profit-sharing gas companies by the adoption of the system by the Dartford Gas Company. The circular announcing the decision of the Directors (a copy of which has just reached us) is dated October last; but in order to give the scheme a good send-off, they determined to date the bonus from the preceding January. Consequently, on the 31st ult. a whole year's bonus was credited to each man willing to enter into the necessary agreement. This binds the Company to provide work for twelve months; and the employee undertakes to obey orders. But there is a proviso to enable any man who has an opportunity of improving his position to leave on a week's notice, with the consent of the Manager, which will be given if the man can be spared without injury to the Company. Every regular man at the start may have an agreement; but afterwards those who are indifferent or careless about their work, or show no interest in the Company, will not have their agreements renewed until they do better. The Directors make it clear that if no improvement is shown within a definite period (warranting the granting of an agreement again) dismissal must result, in fairness to the Company and to those employees who are doing their best in its interests. They also point out that their offer is made to encourage thrift; the bonus being entirely additional to the ordinary salaries and rates of wages, and not in lieu of any benefits, legal or otherwise, to which the officials and men are entitled. It is calculated on the salaries and wages, exclusive of overtime. If the price of gas is at or above 3s. per 1000 cubic feet, there will be no bonus; but for each penny reduction below 3s. the employees will get 1 per cent. The desire of the Directors is that all the officers and workmen should become shareholders in the Company; and so they have decided to pay the annual bonus in shares, at all events for the first few years. Should the scheme not succeed in its objects, the Directors reserve to themselves the power to terminate it on giving not less than six months' notice, to expire at the end of any year.

CO-PARTNERSHIP SCHEMES IN THE GAS INDUSTRY.

Through the co-operation of the Labour Co-Partnership Association, "Co-Partnership"—a publication to which we have referred on several occasions—are able to give in their current issue the following particulars in regard to co-partnership schemes adopted by Gas Companies. The figures relate to the year ended the 30th of June last, which are the latest available.

Our contemporary says: "The figures show the successful application of co-partnership, and prove that nearly 20,000 workers are receiving substantial and tangible benefits from the operation of the various schemes. The actual addition to wages ranges between 3 and 7½ per cent. This phase of industrialism is beyond the experimental stage. It has an experience of two decades behind it, and a capital of more than 40 millions sterling to give it value in the world of commerce. No wonder, therefore, is it that many other companies and corporations are studying the co-partnership system; regarding it as a means of linking the interests that, otherwise diverse, find common ground in the recognition of Labour as well as the rewarding of Capital." We may add that, in addition to the Companies mentioned in the table, those at Dartford, Enfield, Ilford, and Weston-super-Mare have now adopted co-partnership.

Name of Company.	No. of Years Scheme has been in Operation.	Capital in 1909 Total Share and Loan.	No. of Employees under Agreement of Profit Sharing and Co-Partnership.	Amount Divided among Employees for year ending June, 1909.	Amount per Cent. on Wages.	Total Profit to Employees since Scheme adopted.	Amount of Shares and Deposits held by Employees in the Company, Approx. market value, June 30, 1909.	May Employees be on the Board of Directors	No. of Employees' Representatives on Board.
		£		£		£	£		
South Metropolitan . .	Twenty	8,325,340	5138	37,123	7½	464,347	375,000	Yes	2 Workmen's 1 Officers'
Commercial	Since 1901	2,528,280	1221	5,417	5	40,089	43,920	No	None
South Suburban . . .	,, 1894	831,363	582	3,034	6	33,452	34,637	Yes	Two
Newport	,, 1900	318,380	156	384	3·41	3,180	3,607	No	None
Chester.	Eight	242,190	66	297	5	1,916	1,610	No	None
Leamington	Year-and-a-Half	79,790	116	413	5	625	670	No	None
Rugby	..	..	..	..	..	..	..	..	..
Walker and Wallsend .	One	272,918	99	360	4	360	423	No	None
Wrexham	,,	109,290	61	Dec. 31, '08 256	6	256	None as yet	No	None
Tunbridge Wells. . .	Since June 30, '08	174,000	130	425	4	425	550	No	None
Tottenham	..	723,410	601	2,300	4⅛	6,272	Shares 7914 Deposits 4356	No	None
Croydon	Since Dec. 13, '08	690,612	478	1,245	3	1,245	..	No	None
Gloucester.	One	228,000	113	361	5	361	..	..	..
Bournemouth. . . .	,,	651,259	390	1,609	Sliding scale, depending on price of gas	1,609	1,609	No	None
Wellingborough . . .	,,	90,853	59	242	5	242	242	No	None
Gaslight and Coke . .	Since Jan. 1, '09	27,452,193	8439	38,683	5	38,683	None	No	None
Grantham	No figures	till after	March next						
Cardiff	Since June last	645,085	185	655	4	655	Nil	No	None
Watford	Since July 1, '09	165,532	106	Nil	..	..	..	No	None
Total	..	43,528,495	17,940	92,804	4·85 average	593,717	474,538	..	..

GAS SUPPLY IN THE PAST YEAR.

The current number of the "Engineer" contains their customary reviews on various departments of engineering for the past year. The following are extracts from the remarks on the progress of gas supply.

The past year has witnessed no startling development in the use of gas, but a slightly improved efficiency has been secured in burners for lighting and in appliances for heating purposes. As a result of the continuous improvement in the duty obtainable from unit volume of gas through apparatus both for lighting and heating, the consumption of gas has not increased to any considerable extent. There has again occurred, as in the last two or three years, a falling off in the amount of gas supplied per consumer; but loss consequent thereon has again been more than counterbalanced by the gain in the number of consumers. The three Companies supplying Urban London together sold almost exactly the same quantity of gas in the twelve months ended June 30 last as in the preceding twelve months. The Suburban London Companies, however, experienced appreciable increases in their sales of gas, as did also Provincial gas undertakings in districts where growth of population occurred. If we extend our review to a longer period than a single year, returns show that in the decade 1898-1908 the amount of gas sold per annum throughout the United Kingdom increased by 36·6 per cent.

Gas has more than maintained its position for street lighting, thanks to the more general employment of inverted burners, and to the increasing use of gas at high pressure. High-pressure gas-mains have been laid in central parts of London and other large cities, primarily for the supply of gas to high-power lamps for public lighting, but incidentally also for similar lamps in adjacent works and factories. . . . The local authorities in certain suburban districts of London have made comparative trials in street-lamps with inverted burners consuming gas at ordinary pressure and metallic filament electric lamps; and the result has been that, on the score of economy and efficiency, the gas-burners have been preferred, and have been very extensively employed. Gas undertakings have therefore every reason to be satisfied with the progress which has been made in increasing the employment of gas for public lighting during the past year.

The interest in methods of manufacture has centred chiefly in the description of retort or oven used for the carbonization of coal. Inclined retorts set as nearly as may be at the angle of repose of broken coal, which have been very popular in many works for some ten or fifteen years past, are no longer regarded with favour. On the other hand, the horizontal retort, which they were intended to supersede, has regained to some extent its popularity—which, indeed, in many quarters it never lost—by reason of improvements in machinery for charging and discharging it, and of the quite modern procedure of as nearly as possible filling it with coal, instead of, as formerly, leaving a large free space above the charge of coal. The larger charges thus introduced into the horizontal type of retort afford an increased make of gas per retort per diem and per ton of coal carbonized; while stoppages of the ascension-pipes and hydraulic mains by thick deposits are of rarer occurrence. While, therefore, considerable improvement in the efficiency of the old type of carbonizing plant has been achieved in the past year or two, strenuous efforts have at the same time been directed to the perfecting of entirely different and novel systems of carbonization. Various forms of vertical retorts, some charged intermittently and others working on a more or less continuous system of charging and discharging, have been tried in a number of gas-works both here and abroad. Comparatively large chambers or ovens, somewhat resembling the modern forms of oven for the production of metallurgical coke, have also been tentatively adopted in various gas-works. Some of these carbonizing ovens have inclined and others horizontal bottoms; but, broadly, they are distinguished from horizontal and vertical retorts in being of much greater capacity, and in requiring at least double the time for working off this larger charge. At the moment, it is impossible to predict which of the many rival systems of carbonization in vertical retorts and in chamber ovens will ultimately prove the most successful. It can only be said that at best some of them have shown rather better results than are generally obtained from horizontal retorts; but proof is still wanting that the new retorts and ovens are as durable and economical as the old ones. In any case, a chief feature of the modern retort-house is the extensive plant for the mechanical handling of the large quantities of coal and coke which are dealt with therein. In constructional work, the most noteworthy feature of the year is the great number of large gasholders, some of novel design, which have been, or will shortly be, completed.

There has been little change in the price obtainable for gas coke since last year; but a number of gas undertakings have stimulated sales by putting up quantities of 28 lbs. of broken coke in brown paper bags for disposal locally at a low price. Thus the poorer classes are now able to buy from most of the London gas-works a package of ¼ cwt. of coke for 3d. Several other varieties of semi-carbonized coal have been put on the market to compete with coalite, which, however, does not appear to have yet been produced on the extensive scale which was foreshadowed by those interested in its manufacture. But a certain amount has been made at one gas-works in the course of the year, and several gas-works have produced and sold very similar smokeless fuel without adopting the coalite plant. The selling price of sulphate of ammonia remains much the same as at the close of 1908; but the amount of that salt coming on the market from other sources than gas-works has considerably increased during the year. Tar and tar products, generally speaking, are now fetching somewhat better prices than a year ago. The use of tar as a binding material and surface covering for macadamized roads has greatly extended, and coal tar and coal-tar pitch have also been employed on an increasing scale in the manufacture of patent fuel. The production of tar in carburetted water-gas plant has not increased, as the amount of carburetted water gas made on gas-works in the United Kingdom remains about the same as in recent years—viz., about one-eighth of the volume of coal gas produced. As a result, however, of the general reduction in candle power of the gas supplied, less oil has been used for carburetting than formerly, and consequently the output of water-gas tar has become smaller.

THE FATAL FIRE AT CLAPHAM JUNCTION.

Incandescent Electric Lamp Causes the Fire.

The inquiry into the circumstances attending the fatal fire which occurred on the premises of Messrs. Arding and Hobbs, at Clapham Junction, on the 20th ult., was concluded by Mr. John Troutbeck last Tuesday, without any further reference to a suggestion made on the previous occasion that the disaster might have been the result of an explosion of gas.

Among the representatives of the various interests concerned who were in attendance was Mr. L. W. J. Pasmore for the South Metropolitan Gas Company.

On the resumption of the proceedings, the first witness to give evidence bearing on the cause of the fire was *Florence Philbrook*, an assistant, who was at the window where the outbreak occurred, waiting for the assistant window dresser to hand her a necklace taken from the window. She said he was reaching into the window when she heard him call out "Oh!" and then she saw flames on the top of the wadding lining the window. She did not hear an explosion, but a sound like wind escaping from a punctured tyre. Subsequently witness described the noise as "a small pop and a fuse." She was emphatic that the assistant did not knock anything down in the window that could have fallen against a globe, nor did he touch a globe with his arm.

Mr. *Ernest Cooper*, a partner in the firm of Messrs. Holmes and Cooper, electrical engineers and contractors, described in detail the fixing-up of the electric installation in the window for the Christmas decorations. He said the Phœnix Fire Office rules were not adhered to in this case, as the installation was only of a temporary character.

The CORONER: What are the points you have to consider, in work of this kind, in regard to the proper installation of electric light?

Witness: Of course, we have our own rules by which we are going continually. We follow the rules of the Institution of Electrical Engineers—that is, the rules so far as the carrying capacity of the wires goes.

Are you aware of any set of rules governing temporary installations?—No, Sir.

In the course of further evidence, witness said that Tantalum lamps were used, arranged in series of two, with a voltage of 120. He believed the fire was caused by the breaking of a lamp, either through atmospheric pressure or a knock. He thought the window dresser's coat might have caught on a lamp when he reached into the window, or something sharp in his pocket might have come against a lamp and broken it. The possible result of breaking a lamp would be to short-circuit the leads in the lamp itself, and thus put the whole voltage on the other lamp with which it was in series. The effect would be to blow out the internal part of that lamp, causing the globe to break.

The CORONER: How would that lead to fire?

Witness: By the filament dropping down.

Have you experienced that yourself?—No, Sir.

Do you know what happens when a globe breaks, the light being on, in a metallic filament lamp?—I could not speak from experience.

Do you think a metallic filament could drop with sufficient heat to set fire to the cotton wool underneath?—I believe it was so.

In the course of further evidence, witness stated that he had not previously believed it was possible for a metallic filament to keep its temperature for so long a time, nor did he think the temperature of the lamp itself was so great. He warned the window dresser not to put anything near the lamps, as the heat was great enough to warm things up to a dangerous extent if they ever came in contact with the lamps. Though he had heard of these lamps breaking simply from atmospheric pressure, he did not consider them an unsuitable form of lighting for the window in question, as he thought he had arranged them far enough away from the cotton wool to avoid danger.

Mr. *Sidney George Russell*, Consulting Engineer, of Lombard Street, E.C., said he was specially retained by the Phœnix Assurance Company as their Electric Adviser. The Company insured the greater part of Messrs. Arding and Hobbs' risk; but they were not consulted about this temporary work, as permission had been given to the firm to add to their electric lighting at Christmas without notice. Previously, however, he had always been requested to inspect the Christmas arrangements; and he believed it was by an oversight that he was not asked to do so on the present occasion. One of the Phœnix rules was that flexible cord conductors not provided with an efficient flame-proof covering must not be used in windows containing inflammable goods; and this rule was apparently not observed in the case under investigation. He was of opinion that the fire was caused by the bursting of an electric globe. A globe might burst simply through outward atmospheric pressure; and he had known a good many instances of this. It must be regarded as a thing quite possible. Then the filament itself might break, through short-circuiting, and sag against the globe, breaking it. Since the disaster, witness had made experiments with Tantalum lamps, with the following results: (1) A lamp was suspended one or two inches above a pile of dried cotton wool, and the lamp broken with a hammer. Explosion occurred, and the wool instantly set alight in a mass. (2) A lamp was hung 3 inches over wool slightly damp. The lamp was broken, and the same explosion followed; but in this case the wool, not being so dry, was only badly scorched. (3) A lamp was suspended a few inches over slightly damp cotton wool placed loosely below it, and a celluloid telephone mouthpiece was laid on the wool directly below the lamp. When the lamp was broken, the whole lot immediately fired. It was a well-known fact that these globes would explode; and in coal mines and gunpowder factories their use was regulated by Act of Parliament.

Asked by the CORONER if he did not make experiments to show the distance the filament might fall and ignite cotton wool, witness replied that he confined his experiments to a distance of about 3 inches; but he thought if the filament had fallen 9 inches the cotton wool would not have fired twice out of three times.

The CORONER: Do you think the metallic filament would retain the heat longer than the old carbon?

Witness: I do not know that I can fairly say that; but I think it would be almost as long.

In the course of further evidence, witness said he considered the practice of putting these lamps near such material as cotton wool so dangerous that he had often advised the Phœnix Company to give up the insurance rather than take the risk. The practice was one generally pursued in London. Witness added that the electricity installation in the window had been properly carried out, and, in his opinion, the fire was caused by the accidental bursting of the lamp.

The CORONER, in summing up, said it had now been proved that the employment of these electric lamps in connection with certain inflammable material was extremely dangerous; and if in future a fire occurred through their use, the firm responsible would be placed in a very serious position in the event of a fatality. The fact that, as they were told, there were many other business places lighted in this way, and running similar risks, made it most important that firms should take serious warning from the lessons of this fire.

The Jury returned a verdict to the effect that the fire was caused by the breaking of an electric incandescent lamp in one of the windows of the premises; and in doing so they fully endorsed the Coroner's remarks as to the great danger of this style of window dressing.

THE CASE OF GAS POISONING IN BELFAST.

The Corporation and the Supply of Gas-Stoves.

It may be remembered that at the inquest on Mr. John Leeburn, who, as reported last week (p. 58), was found dead in his office in Belfast as the result of poisoning by carbon monoxide—the room containing a gas-stove from which the fumes were not properly conveyed away—the Jury, at the suggestion of the Coroner, recommended that in future the Corporation should not supply any gas-stoves without seeing that there was in every case a proper flue or means of ventilation. The matter was referred to at the meeting of the Corporation on the 3rd inst., when Mr. J. A. Doran, in moving the adoption of the minutes of the Gas Committee, expressed their sincere regret at the fatality. He said that, as there had been some imputation cast upon the officials of the gas-works, it was his duty to state the facts. When the late Mr. Leeburn was ordering the stove used in his office, they told him that they would put in a flue; but he said he would put in one of his own. This was eighteen months ago; and, unfortunately for himself, Mr. Leeburn did not put in the flue. Lest the Committee might be blamed for any similar accident in future, they had determined never to allow anyone to get a stove until a flue was provided. Mr. Henry Johnston said he was surprised that the Committee had decided to refuse stoves unless they were allowed to put in flues. Hitherto any man going for a stove could get it, and he could put in the flue independently of the Gas Department. The gas officials had had no connection with the defectively arranged stove in Mr. Leeburn's office. Mr. Doran replied that it would be recognized by the Gas Department as their duty to see that flues were provided in future.

OXFORD CORPORATION WATER SUPPLY.

Local Government Board Inquiry.

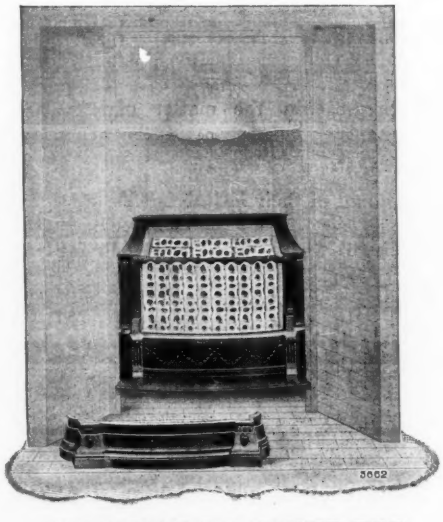
At the Oxford Town Hall last Wednesday, Mr. A. G. Drury, M.Inst.C.E., one of the Inspectors of the Local Government Board, held an inquiry in connection with an application made by the Corporation for sanction to the acquisition of certain land and the construction of works for the purposes of their water undertaking. The powers sought for were to alter and enlarge the service reservoir and the road of access at Forest Hill; the pumping-station, engine, and machinery erected by the Corporation at the reservoir, authorized by the Oxford (Corporation) Water-Works Act, 1875; a conduit or main pipe commencing in St. Clement's, and terminating at Forest Hill; and another commencing at the service reservoir at Forest Hill, and terminating at Headington Quarry. Authority for the expenditure of money on the works was also applied for. Among those present were the Parliamentary Agent for the Corporation (Mr. John Kennedy), the City Solicitor (Dr. H. F. Galpin), the Mayor (Mr. J. E. Salter), the City Engineer (Mr. W. H. White), and the City Accountant (Mr. W. S. Carver).

Mr. KENNEDY, in opening the inquiry, said he assumed the Inspector had had an opportunity of informing himself as to the nature of the application. It was in pursuance of a request of the Local Government Board, contained in a letter received by the Town Clerk from the department. In this letter, after dealing with the previous correspondence in relation to the water undertaking of the Corporation, the Board pointed out that the Corporation Act of 1885 did not enable the Board to sanction further loans in connection with the undertaking; and they suggested that the Corporation should apply for further powers to enable the Board to sanction certain water-works which had been constructed in the interest of the district and the consumers.

Mr. *White* was then called, and said the area of water supply for which the city was responsible was wider than the city of Oxford, and included the parish of Headington, of which there was a Rural District Council. When the district of Headington developed, the city was approached by the Council; and it was found they were under an obligation to keep the supply at constant pressure. Having ascertained that in this area there was no land at a sufficient height to give the pressure required, they looked elsewhere, and found a site outside Headington, but in the area of the District Council. Having acquired the land, a reservoir was constructed of a capacity of 100,000 gallons. It was a covered reservoir of brick and concrete, with steel girders carrying the roof; and it was placed in electrical communication with the other reservoir in Oxford. The cost altogether, apart from the land, was £1400. A sum of £750 was paid for the land. The cost of the pumping-station was £870. The district was one which was developing rapidly, and the population, which was mainly of the working class, had doubled the last few years. The work was carried out in

The Patent "Thermo"

Firefront



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has removed any objection to Gas-heating, and made Gas Fires no longer the exception but the rule.

But it must be the "THERMO."

JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.

224

the winter of 1902-3. The Corporation were at first unwilling to do the work. The average daily pumping in 1903 was 12,000 gallons, and it had now risen to 48,000 gallons. The figure for the rising main was £2130, and for the return main £320. The total for the various items was £5470; and this was the capital expenditure the Local Government Board were invited to sanction.

Mr. *Carver* produced the water-works capital account. He said the money in question was expended in 1908-9. They would accept any reasonable period for repayment of the loan, but would, of course, like as long as possible, as the works were permanent. As to the sum they had already borrowed, perhaps the Board would allow them to antedate their sinking fund to the date when they actually borrowed.

The INSPECTOR: You wish the sanction of borrowing to be retrospective; the period to run from 1908?

Mr. KENNEDY pointed out that in recent years the period allowed by Parliament for land was 50 years, and for reservoirs and embankments 45 years.

Mr. *Carver* said the population of the city, according to the census of 1901, was 49,336; it was now estimated to be 51,946, from the Medical Officer's returns. The assessable value was £406,000. The total net debt, excluding education, was £396,096. The general district rate was 3s. 9d. in the pound; the poor rate was, on the average, 10d. for the year—making a total of 4s. 7d.

Dr. GALPIN, on behalf of the Town Clerk, who was unavoidably absent, thanked the Board for their assistance, and the Inspector for his courtesy.

The inquiry then closed.

TAR AND TAR PRODUCTS LAST YEAR.

From an article on "The Bye-Products Market in 1909," in the "Iron and Coal Trades Review" for the 31st ult., we take the following particulars in regard to tar and tar products.

The production of tar has expanded of late years, owing to the introduction of the recovery oven, and demand has hardly kept pace. Thus during the last ten years a heavy depreciation in values has had to be faced by producers. At the beginning of the year, prices were no better than 12s.; remaining at this level until the end of March, when, in response to the advance of pitch, values stiffened, and rose steadily to 18s. in July and to 19s. in August, when pitch was quoted at 31s. During the last quarter, however, pitch has dropped back to 27s., and tar closes the year at from 17s. to 18s. A new outlet has been found for the surplus in preparing dustless roads; and this promises to exercise an important bearing on future values, as protracted experiments have proved the superiority of dehydrated tar over all other substances for this purpose.

Pitch opened the year at 18s. 6d., London, advancing steadily to 30s. in August, and closes at 28s., with a good demand and encouraging prospects for 1910. Exports during the year have been less than in 1908; the decline approaching 47,000 tons. The principal constituent of coke-oven tar, the position of pitch bears prominently on tar values, is accepted in many instances as the principal medium or determining factor in adjusting sliding-scale contracts. Hence the desirability of ascertaining the position and prospects of this article when closing tar contracts.

Creosote oil has been in steady demand throughout the year; fluctuating but slightly in price, and closing at from 2½d. to 2¾d., London—practically the same price at which January fixtures were negotiated. The volume of trade has been fully equal to 1908, and the New Year opens with promise of a successful period.

Benzols have not been altogether a satisfactory feature (the supply having constantly been in excess), and remunerative prices have been the exception rather than the rule. German makers have produced less than half the capacity of their plants, and keen competition has been experienced in France by English makers; 50-90's have remained generally higher than 90's, and pure has been exceptionally difficult to sell. Comparisons in January and December are as follows: 90's, 6½d., 6⅝d.; 50-90's, 7¼d., 7½d.; pure, 8d., 8d., all casks included—prices being nominal, and sellers generally experiencing difficulty in closing fixtures near quoted prices. The key to the situation appears to be the adoption of benzol as a motor spirit; but so far little progress has been made—one attempt during the year to exploit the use being attended by failure. However, it is stated that other trade interests are about to put on the market a quality used extensively in Germany; and it is hoped that more success will attend their efforts.

Toluol has been scarce, and in good demand throughout the year, closing quite 1d. better than the price at which earlier fixtures were arranged.

Naphthas, crude, solvent, and heavy, have been steady and profitable features during the year, fluctuating but little, and generally closing at higher prices than those ruling in the first quarter. Judging by the contracts recently fixed, prices are likely to be maintained for some time.

Carbolics have been very unsatisfactory, and prices compare unfavourably with those ruling during 1908. Exports have declined, and the home trade has been poor; cresylic having experienced, on the other hand, a good demand at better prices.

Anthracene has been dull and difficult to sell; exports being reduced approximately 40 per cent.

Naphthalene has been in better demand, and prospects for 1910 are encouraging.

Generally, from the distillers' point of view, the New Year opens with some encouraging features, which it is hoped may become established facts as the season advances.

Liverpool Water-Works Rating Appeal.—The judgment in this case (see *ante*, p. 49) was to have been delivered last Wednesday at the Preston Quarter Sessions; but the Chairman announced that it had been deferred till the 24th prox.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I suppose that the item of information of most interest with which I have to deal this week is the disposal by Lord Mackenzie of the action brought by Mr. W. Ewing against the Corporation of Greenock. We all greatly regret, for Mr. Ewing's sake, that he has been unsuccessful. Lord Mackenzie has found that all the circumstances were adverse to Mr. Ewing's claims. He indeed goes further, and finds that, out of Mr. Ewing's own mouth and from his pen, it was evident he served at Greenock all along under the belief that he was Engineer as well as Manager. Besides the facts in his own case, Mr. Ewing had to overcome the presumption against him, arising from the decision, in quite recent times, of two somewhat similar cases—that of the representatives of Mr. Cooper, Burgh Engineer, against the Corporation of Edinburgh, and of Mr. Mackison, Burgh Surveyor, against the Corporation of Dundee. Both these cases were decided adversely to the claimants. The truth is that postponed claims are the most difficult of all to establish. The fact that they are postponed is evidence that the claimant has no great belief in the strength of his position. Were he convinced of the rectitude of his cause, there would be no reason for delay in letting his expectation be known, but, on the contrary, every reason, in his own interest, and likewise in the interest of justice to the other side, that he should not delay. It will be observed that Lord Mackenzie disposes of the case upon the facts. There is scarcely any law in his decision. This circumstance will make it more difficult for Mr. Ewing to obtain a reversal of it, supposing he should attempt to do so. Courts of appeal are chary of disturbing decisions which rest upon fact, for the reason that the judge of the first instance has the advantage of hearing the evidence and seeing the witnesses, and, consequently, is in a better position to judge of many things which cannot be reproduced so tellingly in the printed documents which are laid before the appellate tribunal. Mr. Ewing's chances of success, therefore, in going further are not hopeful. In the Edinburgh case, the Corporation, after gaining, voluntarily offered a substantial sum, which was accepted. This might be the better way in this case. There is no doubt that, whatever the legal position, Mr. Ewing did extra work, or that, at all events, he did work which in the case of an ordinary Corporation dealing with a manager with whose services they were satisfied, would have entitled him to some pecuniary recognition. Mr. Ewing's relations with the Corporation were of a strained nature; and this fact, coupled with our knowledge of the treatment by them in later years of Mr. S. Stewart, rather emphasizes the improbability of the Corporation agreeing to offer anything to Mr. Ewing. There are, however, two channels through which the Corporation might be successfully approached in such a matter. The one is that they might be induced to offer a sum by way of compromise; and the other is that someone might be found who would be willing to act as mediator between them, and get the Corporation after having obtained judicial certification that their cause was a just one, to assume the more amiable spirit of generosity.

The two subjects, which are in effect twins, of high-pressure gas distribution and incandescent gas lighting, were before the Western District of the Scottish Junior Gas Association to-night. Both subjects were introduced by gentlemen who are in the inner circle of the experts, and, consequently, the information they were able to lay before the members was of a very high order. To students of gas-supply problems the papers will be very valuable, as they deal with the matters which at the present moment are exercising, more than any others, the minds of gas engineers. The Association were fortunate in obtaining two such authors.

This forenoon there was a somewhat unfortunate explosion of gas in Glasgow. The School Board of the city maintain a Truant School at Shettleston, in which there are over 120 boys. In the morning it was discovered that a gas-bracket in the store-room attached to the Shoemaking Department was broken, and as there was an escape of gas, the supply was at once cut off. No danger was apprehended, and the boys employed in the shoemaking department, and in the tailoring department adjoining, were allowed to continue at work. An hour later one of the lads had occasion to enter the store-room. There are no windows in the apartment, and he carried a light. As soon as he opened the door there was a loud explosion. A glass partition which separated the two workshops was thrown down, and in its fall it unfortunately injured a number of the boys. In all, about twenty of the boys were either cut or burned. Two of them were so seriously injured that they were sent to the Royal Infirmary for treatment; the others being treated in the school.

In the Inverkeithing Town Council last night, Mr. Paterson moved that a Committee be appointed to consider the advisability of introducing electricity in the burgh. There could be no doubt, he said, that electricity would be in great demand in the district shortly, and the Town Council ought to safeguard themselves with regard to any company that might come in to oppose them. He contended that electricity, whether generated locally or purchased in bulk, could be supplied at half the cost which was being charged for gas at the present time. From information he had obtained, electric light could be supplied at 3d. per unit, or equal to about 3s. per 1000 cubic feet for gas. Mr. Scott, who moved the previous question, thought that, seeing the whole matter of lighting was looming very much ahead, they might delay the matter meantime. Only Mr. Paterson and his seconder supported the motion, which was accordingly lost.

Owing to the failure of the switch mechanism at the Corporation Electricity Station in Leith last night, half of the consumers in the burgh were deprived of light for about a quarter-of-an-hour. The arc lights in the streets went out; and most of the thoroughfares were in darkness. The mishap occurred about half-past eight, when a large political meeting in the Assembly Rooms was being addressed by Mr. Munro Ferguson, the former Member of Parliament for the burgh; and the proceedings were stopped until a lamp and candles were procured. Mishaps with electric lighting are reported from Dumfries.

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 8.

Sulphate of Ammonia.

The tone of the market has been buoyant the whole week, and all output continues to be eagerly sought after as it becomes ready for delivery. Not only are requirements to cover old contracts apparently still unsatisfied, but the firmness has been accentuated by new orders making their appearance. The result is that prices have again advanced somewhat; and the closing figures are £11 7s. 6d. to £11 8s. 9d. per ton f.o.b. Hull, £11 10s. to £11 11s. 3d. per ton f.o.b. Liverpool, and £11 11s. 3d. to £11 12s. 6d. per ton f.o.b. Leith. The forward position seems to have been rather neglected of late; interest being mainly centred in near delivery. £11 12s. 6d. per ton f.o.b. the best ports is still given as the quotation for January-June; but, so far, this price is not reported to have been paid.

Nitrate of Soda.

This market is still without any new feature, and values are just quietly maintained at 9s. 3d. per cwt. for ordinary and 9s. 6d. for refined quality, on spot.

LONDON, *Jan.* 10.

Tar Products.

The market for coal tar pitch has been firm throughout the past week. Although prices have not actually advanced, they have been well maintained at previous levels, and buyers seem to be thinking more seriously of accepting offers put forward by makers. Creosote is quiet but steady; and it is believed that an improvement in this article will take place after the heavy winter make has been disposed of. For prompt delivery, 90 per cent. benzol is still very firm; while for forward, makers are asking better prices. Benzol, 50-90 per cent., is very firm indeed, owing to the demand for toluol, which is exceedingly scarce in the North and in good demand. Solvent naphtha is steady, although no advance has taken place in price. Heavy naphtha is quiet. Crude carbolic is weak, and Continental consumers decline to purchase at present except at very low figures. Naphthalene is dull; but creosote salts are in good demand.

The average values during the week were: Tar, 14s. 3d. to 18s. 3d., *ex* works. Pitch, London, 29s. 6d. to 30s.; east coast, 28s. 6d. to 29s.; west coast, 29s. to 30s. f.a.s., 28s. 6d. f.o.b. Benzol, 90 per cent., casks included, London, 6¾d. to 7d.; North, 6d.; 50-90 per cent., casks included, London, 7¼d.; North, 6¾d. to 7d. Toluol, casks included, London, 9¾d. to 10d.; North, 9½d. Crude naphtha, in bulk, London, 4d. to 4¼d.; North, 3¾d. to 4d.; solvent naphtha, casks included, London, 1s. 1½d. to 1s. 2d.; North, 1s. to 1s. 1d.; heavy naphtha, casks included, London, 11¾d.; North, 10¾d. to 11¾d. Creosote, in bulk, London, 2½d. to 2⅝d.; North, 2d. to 2¼d. Heavy oils, in bulk, 2⅝d. Carbolic acid, 60 per cent., casks included, east coast, 10¾d.; west coast, 10⅜d. Refined naphthalene, £4 10s. to £8 10s.; salts, 40s. to 45s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article remains firm, although the buying has not been quite so heavy as last week. Beckton prompt is £11 8s. 9d., and for January-June £11 12s. 6d. For outside makes London, £11 3s. 9d. to £11 5s. is asked; and in Hull the price is £11 6s. 3d. In Leith, the majority of makers seem fairly well sold for the prompt position; and for January-June, they are asking £11 12s. 6d. In Liverpool, £11 7s. 6d. to £11 8s. 9d. is quoted.

COAL TRADE REPORTS.

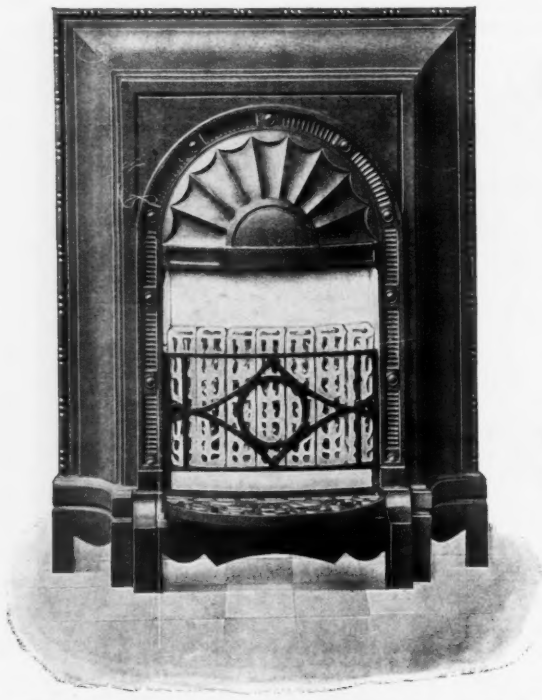
Northern Coal Trade.

Both in Durham and Northumberland there has been friction between employers and employed as to the working of the Eight Hours Act, and the production has been very much reduced in consequence in both counties—a number of important collieries having been idle several days. Naturally, this has made sellers unable to do business; and where sales were possible, prices have varied so greatly that it is very difficult to give any quotations. Both in the steam coal trade and in that of gas coal, the prices are more according to the needs of the buyer than to any standard. In the Northumbrian coal trade, there is some sign of a settlement, which would speedily change prices; but at present there is a wide variation. Best steams may be quoted perhaps at 13s. 6d. to 14s. 6d. per ton f.o.b.; but the rates will vary quickly. The gas coal trade of Durham is much affected, and many of the chief collieries have been laid idle for some days, so that the shipments on contract have been interfered with a good deal. Prospects are better at the time of writing; but a few days will be needed to see how far they will be realized. Until this is decided, there is not much disposition to quote prices, which for gas coal are not likely to move like those of steam coal. The former kind are much more sold on contract; and the chief result of the difficulty is the stoppage of shipments for the time being to a large extent. Gas coke is firm, with quotations varying from 13s. to 13s. 6d. per ton f.o.b.

Scotch Coal Trade.

There was no market last week, and consequently quotations cannot be given. The shipments are reported to have amounted to 300,191 tons—a decrease of 18,636 tons upon the preceding week, but an increase of 120,388 tons upon the corresponding week of last year.

Another Gas Poisoning Case in Belfast.—Alderman John Rooney, a member of the Belfast Corporation, was found unconscious in his house last Friday night as the result of gas poisoning; and he died on removal to the hospital. The deceased gentleman had earlier in the day attended a meeting of the Council.



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Mr. Masterman, M.P., and the West Ham Amalgamation.

Speaking recently at a dinner hour meeting of gas workers, Mr. C. F. G. Masterman, the member for West Ham, said he had come there specially to give the employees of the West Ham Gas Company an opportunity of putting to him any question they liked with regard to the amalgamation of that Company with the Gaslight and Coke Company. The Government had nothing to do with the amalgamation. They could not stop it. All they could do was to obtain the best possible terms for the men. They had secured an undertaking that the works at Stratford should be kept open for ten years; and if the combined Company did not do this, the men should let him know, and then they could enforce their legal rights. Replying to a question as to why he had not voted against the amalgamation of the two Companies, Mr. Masterman said the Bill was sent to a Select Committee which consisted of one member from each section of the House; and when this Committee voted in favour of the Bill, no members of the Government could vote against it, though they could vote for it. He was not prepared to vote for the Bill; and, as a member of the Government, he could not vote against it. But had he been a private member, he should certainly have done so.

Water Supplies to Hotel by Meter.—The Torquay Town Council had under consideration on Tuesday last the question of enforcing a new scale of charges for water, under which hotels will be supplied by meter. A petition against the proposed change in the method of charging had been presented by the hotel proprietors; and, in view of their hostility to the new system, the Town Clerk sought Counsel's opinion as to whether the Council were acting within their legal rights, and what course of procedure should be adopted to enforce the charges. Mr. Macmorran, K.C., to whom the matter was submitted, advised the Corporation to bring an action against the hotel proprietors, and expressed the opinion that there was no practical danger of their failing to obtain a decision on the main issues in such action. The Water Committee recommend that it be left to the Town Clerk to take action as advised; and the recommendation was adopted.

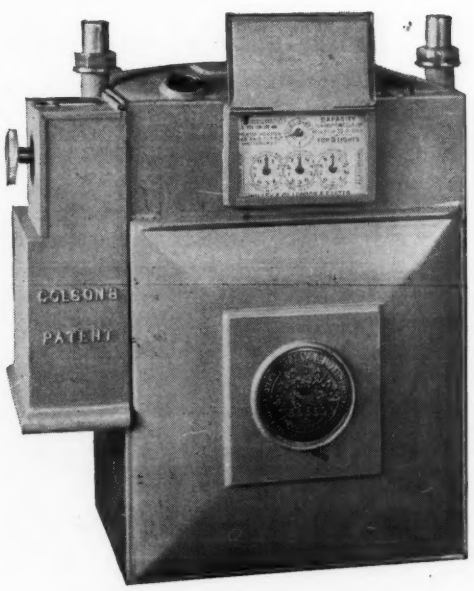
Public Lighting of Bideford.—In a report made to the last meeting of the Bideford Town Council, the Lighting Inspector complained that no reliance could be placed upon the lighting of certain lamps to which automatic controllers had been fixed. A letter was read from Mr. W. D. Joce, the Secretary to the Gas Company, in reference to complaints of the irregular lighting of the lamps, in which he stated that the extinguishing of them was almost entirely due to stormy weather. Mr. W. A. Cox thought the explanation unsatisfactory, as there had been no gales such as would account for the irregular lighting of the lamps. The Council decided to refer the question of the renewal of the gas contract to a Committee of the whole Council, and directed that in the meantime a letter should be sent to the Gas Company stating that the reply received from Mr. Joce did not meet the complaint, and requesting that the automatic controllers put in as an experiment should be removed forthwith.

Exmouth District Council and the Gas Company.—It was stated at a meeting of the Exmouth District Council last Wednesday that the Finance Committee had had under consideration a report by the Surveyor on the Bill which the Exmouth Gas Company are promoting next session, and saw no reason why the Council should oppose it. Mr. Daw thought they ought to have a clause inserted giving the Council power to purchase the Company's undertaking; and he moved that steps be taken to obtain this. The motion was carried.

Suicide by Coal Gas.—A verdict of "Suicide during temporary insanity" was recorded at an inquest held at the Wandsworth Town Hall a few days ago, by Mr. John Troutbeck, on the body of Joseph Hubert Leonard, aged 54, a newsagent, lately carrying on business in Putney Bridge Road. The wife of the deceased said her husband, from whom she was separated, had been drinking for three days, and had frequently threatened to commit suicide. A constable deposed that Leonard had placed a gas-ring upon a saucepan on the copper, covered his head with an overcoat, and inhaled the gas. Dr. John Trist, who was called in, said an autopsy revealed all the characteristics of poisoning by coal gas, which was the cause of death.

Quality of Eastbourne Gas.—At the meeting of the Eastbourne Town Council on the 3rd inst., the Town Clerk reported on the subject of an interview he had had with Mr. Arthur Valon, and the terms on which the latter was prepared to report upon the gas tests and the accounts of the Gas Company. The Borough Surveyor submitted the results of his tests as regards the calorific value of the gas. It was resolved to inform the Gas Company of the decreased and varying calorific value of the gas supplied; but the question of retaining Mr. Valon was deferred. The Borough Surveyor reported that the average illuminating power of the gas for November was 15·06 candles; the highest being 15·67 and the lowest 14·82 candles. The standard fixed by the Company's Act was 14 candles.

Exmouth Water Bill.—A special meeting of the Exmouth Town Council was held last Thursday evening, at which the resolution in favour of promoting a Bill for extending the Council's power in relation to the water supply was confirmed by a majority of 12 to 5. This was followed by a public meeting of owners and ratepayers of the town. Mr. W. C. Creedy, the Chairman of the District Council, presided over a large gathering. He said it had been proved that sufficient water was to be obtained from the well at Dotton, and that the quality was very good. The entire expense would not be more than £18,000. A resolution in support of the Bill was moved by Mr. R. Ley. Rev. O. J. Reichel, on behalf of the opposition, proposed to move a resolution against the Bill, on the ground that the scheme would unduly raise the rates. The Chairman, however, ruled that this was equivalent to a direct negative of the motion. After a long and animated, and occasionally noisy, discussion, a vote was taken on the resolution by show of hands. The Chairman declared the resolution carried, and a poll was demanded. On a poll last year, a majority of the votes given was against the scheme.



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The Cow-Poisoning Case at Charing.

It will doubtless be remembered that a few weeks ago the Judge at the Ashford County Court was engaged for two days hearing a summons taken out by Messrs. G. Ellen and Sons, farmers, of Charing, against the Kent County Council, for £26 16s. 6d. as compensation for the loss of a cow which they alleged had been poisoned by tar from a main road under the control of the Council washing into a stream from which the plaintiffs' cows drank. The case aroused considerable interest, as it was believed to be the first of the kind which had arisen in the United Kingdom. At the close of the evidence on the second day of the hearing (Nov. 29 last), his Honour reserved his decision. This he gave yesterday in favour of the plaintiffs, with costs. The proceedings in the summons were reported in the last volume of the "JOURNAL" (pp. 414, 685); and the judgment will be given next week.

Suicide by Gas in Dundee.—In the early morning of Wednesday last, James Arnott, 29 years of age, a shoemaker, residing in Strathmartine Road, Dundee, committed suicide by inhaling gas. He was found by his brother lying on the bed. A gas-jet had been placed on a bench in front of the bed, and the unfortunate man had turned the gas full on, and had then pulled a waterproof coat over the jet and over his head.

London County Council Expenditure.—The annual report of the proceedings of the London County Council for the year ended March 31 last has just been issued. The volume contains detailed reports by the various Committees of the Council, an abstract of accounts, and a summary of the provisions of Acts affecting London or the work of the Council passed by Parliament in the session of 1908. The total expenditure of the Council during the year under every head of service on both income and capital accounts was £14,507,000; this amount including loans to other bodies. The net debt of London secured upon the rates on March 31, 1908, was £109,931,239, which was equal to more than two-and-a-half times the rateable value; and on March 31, 1909, it was £49,938,631 (comprising £40,105,573 in respect of remunerative services and £9,746,165 in respect of rate services), and £86,893 in respect of the Works Department.

Price of Gas to Prepayment Consumers in Manchester.—At the meeting of the Manchester City Council last Wednesday, an old controversy was revived by Mr. Jennison asking the Council to say that the time had arrived "when, in the interests of common justice to the poorest of our ratepayers, the price of gas to users of penny-in-the-slot meters should be the same as to users of quarterly meters." Mr. Jennison had given notice of a motion to this effect; but, acceding to the request of the Chairman of the Gas Committee (Alderman Gibson) the Council agreed to deal with the matter in conjunction with the minutes of the Committee. Alderman Gibson gave several reasons why, in his judgment and that of his colleagues, the Council ought not to accept Mr. Jennison's proposal. It cost, he said, 3½d. or 4d. more per 1000 cubic feet of gas to collect in the case of slot-meters than in that of ordinary meters. There were 60,000 of the former class in use in Manchester, and no complaint had been received from any consumer. If the Council would relieve the Committee of the obligation to contribute £50,000 a year in aid of the rates, the Committee would willingly endeavour to reduce the price of gas all round; but to single out the slot-meter users for preferential treatment they felt was utterly beyond their power. The motion was defeated.

Universal Gas Methane and "Buisson Hella" Company.—A circular has, says the "Financial Times," just been issued by Messrs. Robertson Lawson and Georges Lemarquis, Joint Liquidators of the Universal Gas Methane and "Buisson Hella" Company, stating that the scheme of arrangement for the purchase of the assets in exchange for shares in the Société Industrielle du Gas Methane, which was approved at meetings of the preference and ordinary shareholders last November, has now been sanctioned by the Court of Chancery. The Court has also fixed the period within which the creditors—whose claims must be settled before those of the shareholders—must come in and prove their debts, failing which they will be excluded from participation. The final date named is Jan. 31. The circular continues as follows: "As soon as all questions with creditors have been settled, we will notify by circulars and advertisements in the newspapers the date on which the exchange of shares will take place. This will be effected in the City of London, at the Liquidators' offices, and will be as follows: Each holder of ten preference shares will receive two Participating Shares, Series A, and one Participating Share, Series B. Each holder of ten ordinary shares will receive one Participating Share, Series A, and two Participating Shares, Series B."

Lighting of Nottingham Market by "Selas" Lamps.—After a test of some weeks' duration, it has been decided to discard the present sixteen 1000-candle power arc lamps now used in Nottingham Market, and replace them by sixteen 3000-candle power high-pressure "Selas" gas-lamps. According to the "Trader," it is hoped to have the work completed and the lamps lighted about the end of the present month. It is estimated the saving in cost of current and maintenance will be £250 per year, with a candle power three times greater than that of the lamps hitherto used. A 60,000-candle power compressor is being fixed in the shambles, and will work in duplicate with that of the market; so that in case either one of the electric motors fails the other one will be equal to the demand for the 670 stalls lights as well as the 16 high-power gas-lamps. Alterations are being made in the shambles for the convenience of the compressors and lamps. No doubt a great number of people will wonder, says our contemporary, how the 670 lamps and over 3000 feet of piping can be moved in and out once and sometimes twice a week. This, however, is made very simple by a number of ingenious joints that have been invented by Mr. Docking, by which means the piping and lamps can be fixed by six men in five hours, and taken in and stored in three hours. The breakage of mantles does not exceed 8 per cent. per week, owing to the fact that the "Selas" mantles are specially made to stand excessive vibration. The whole of the market under the new system will, it is safe to assert, have a very striking appearance.

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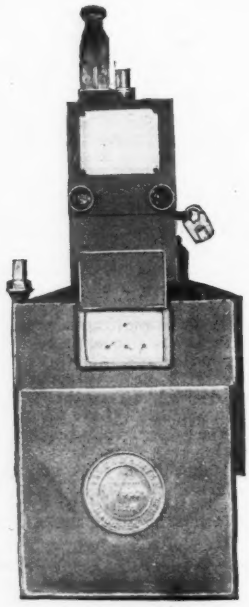

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The Extensions at the Rochdale Gas-Works.—At last week's meeting of the Rochdale Town Council, the extensions recommended by the Gas and Electricity Committee, already referred to in the "JOURNAL" (*ante*, p. 59), were approved.

The Gas Explosion at Lydney Park.—In the last number of the "JOURNAL" (p. 58), reference was made to a serious gas explosion which took place on the 30th ult. at Lydney Park, the residence of Mr. C. Bathurst, the Unionist Candidate for South Wiltshire. One of the maids, named Annie Pearce, was so badly injured by the explosion that late last Friday night she succumbed to her injuries.

Messrs. Chancellor and Sons, of Richmond (Surrey), will be offering by auction on the 25th inst., at the Greyhound Hotel, Richmond, by order of executors, £1958 of consolidated ordinary stock of the Richmond Gas Company, paying 5¼ per cent.; also £360 of 5 per cent. debenture stock. The Richmond gas stock has always been held in great favour; and consequently it seldom comes into the market.

In connection with the amalgamation of the West Ham Gas Company with the Gaslight and Coke Company, a "farewell" dinner of members of the staff of the former Company has been held at the Falstaff Hotel, Eastcheap—Mr. A. G. Snelgrove, the Secretary, in the chair. In proposing the toast of "The West Ham Gas Company," the Chairman said he had received the following letter from Mr. J. L. Godles, the Chairman of the Company: "The passing away of the West Ham Gas Company brings with it some regrets; but it leaves with me a long series of very pleasant memories. I trust that you and all the staff will also carry away pleasant recollections of the old Company, the old works, and the old Board of Directors; and in parting with you all, I do it with a sense of deep indebtedness for good work well done by all of you, and with very hearty good wishes for your happiness and prosperity in the New Year and very many years to come." Mr. Snelgrove then proceeded to give an interesting account of his half-century's connection with the undertaking, contrasting the conditions of fifty years ago and now. The toast was responded to by Mr. G. T. Gwinn.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ENGINEER AND MANAGER. Beccles Water and Gas Company. Applications by Feb. 1.
FOREMAN (Tar-Works). No. 5169.

Patent Rights, &c., for Disposal.

APPARATUS FOR GASIFYING RAW COMBUSTIBLE MATERIAL. S. F. Paul and Co., Doughty Street, W.C.
SAFETY GAS VALVE AND METER VALVE. C. B. Forbes, New York.

Plant, &c., for Sale.

WASHER SCRUBBER. Mansfield Gas-Works.

TENDERS FOR

Boiler.

BURSLEM GAS DEPARTMENT. Tenders by Jan. 20.

Elevator (for Purifiers).

BURSLEM GAS DEPARTMENT. Tenders by Jan. 20.

Fire-Clay Goods, &c.

EAST RETFORD GAS DEPARTMENT. Tenders by Feb. 3.
GUILDFORD GASLIGHT AND COKE COMPANY. Tenders by Jan 28.
HEYWOOD GAS DEPARTMENT. Tenders by Jan. 18.

Retort Bench, &c. (Dismantling Old and Rebuilding New), Complete.

EAST RETFORD GAS DEPARTMENT. Tenders by Feb. 3.

Tar

PRETORIA MUNICIPALITY. Tenders to London Agents by Jan. 20.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

Subscribers who desire to avail themselves of the reduction in the Subscription by paying in advance for the Year 1910, are reminded that this can only be done during the present month.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 86.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,474,000	Stk.	Oct 14	5	Alliance & Dublin Ord.	85–87	..	5 14 11
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	100–102	..	3 18 5
200,000	5	Oct. 28	6¼	Bombay, Ltd.	5⅞–6	..	5 8 4
40,000	5	,,	6⅛	Do. New, £4 paid	4⅞–4⅞	..	5 6 8
50,000	10	Aug. 26	15	Bournemouth Gas & Water: 10 p.c.	28½–29	..	5 3 5
311,810	10	,,	7	B 7 p.c.	16½–16⅝	..	4 3 7
75,000	10	,,	6	Pref. 6 p.c.	15⅛–15⅜	..	3 16 2
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	253–256	..	4 17 8
300,000	,,	,,	9½	Do. New	189–191	..	4 19 6
50,000	,,	,,	5	Do. 5 p.c. Pref.	120–122	..	4 2 0
206,250	,,	Dec. 29	4	Do. 4 p.c. Deb.	99–101*	..	3 19 3
220,000	Stk	Sep. 10	11	Brighton & Hove Orig.	217–220	..	5 0 0
246,320	,,	,,	8	Do. A Ord. Stk.	154–157	+1	5 1 1
460,000	20	Oct. 14	10	British	42⅛–43⅛	..	4 11 11
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	118–120	..	5 0 0
165,700	,,	,,	4½	Do. B 3½ p.c.	88–90	..	5 0 0
82,278	,,	'	5½	Do. C 5 p.c.	106–108	..	5 1 10
55,000	,,	Dec. 29	3½	Do. 3½ p.c. Deb.	87–89*	..	3 18 8
500,000	10	Oct. 14	7	Buenos Ayres (New) Ltd.	14–14⅛	..	4 16 7
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98–100*	..	4 0 0
100,000	10	—	—	Cape Town & Dis., Ltd.	3 4	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	5⅜–5⅝	..	—
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48–49	..	6 2 6
100,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	80–82*	..	5 9 9
157 150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	108¼–110½	..	4 10 6
1,493,280	Stk.	Aug. 26	5⅝	Commercial 4 p.c. Stk.	109–111	..	4 13 8
560,000	,,	,,	5	Do. 3½ p.c. do.	103–105	..	4 15 3
475,000	,,	Dec. 29	3	Do. 3 p.c. Deb. Stk.	8–83*	+1	3 12 3
800 000	Stk.	Dec. 10	5	Continental Union, Ltd.	95–97	..	5 3 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	137–139	..	5 0 9
492,270	Stk.	—	5	Derby Con. Stk.	121–123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk.	103–105	..	3 16 2
148,995	,,	Oct. 2	5	East Hull 5 p.c. Ord.	98–10	+1	5 0 0
486,090	10	July 14	12	European, Ltd.	24½ 25	..	4 16 0
354,060	10	,,	12	Do. £7 10s. paid.	18½–19	..	4 14 9
15,141,545	Stk.	Aug. 12	4⅝	Gas light and Coke: 4 p.c. Ord.	103⅜–104⅛	+⅛	4 9 4
2,600,000	,,	,,	3½	3½ p.c. max.	87–89	..	3 18 8
3,799,735	,,	,,	4	4 p.c. Con. Pref.	103–105	..	3 16 2
4,193,975	,,	Dec. 29	3	3 p.c. Con. Deb.	81–83*	..	3 12 3
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	94–96	+2	5 4 2
82,500	,,	,,	6½	Do. do. 5 p.c.	118–120	+1	5 8 4
70,000	10	Sep. 29	11	Hongkong & China, Ltd.	17⅛–18	..	6 2 3
131,030	Stk.	Sep. 10	6½	Ilford A and C	144–146	..	4 9 0
65,780	,,	,,	5	Do. B	108–110	..	4 10 11
65,500	,,	Dec. 29	4	Do. 4 p.c. Deb.	100–102*	..	3 18 5

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
4,940,000	Stk.	Nov. 11	8	Imperial Continental	175–177	..	4 10 5
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	94–96	..	3 12 11
195,242	Stk.	Aug 26	6	Lea Bridge Ord. 5 p.c.	119–121	..	4 19 2
561,000	Stk	,,	10	Liverpool United A	223–225	..	4 8 11
718,100	,,	,,	7	Do. B	166–168	..	4 3 4
306 083	,,	Dec. 29	4	Do. Deb. Stk.	102–104*	..	3 16 11
75,000	5	Nov. 26	6	Malta & Mediterranean	4⅞–5	..	6 0 0
560,000	100	Oct. 1	5	Met of 5 p.c. Deb	59–102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100–102	..	4 8 3
541,920	20	Nov. 11	3½	Monte Video Ltd.	12½–13	..	5 7 8
1,775,892	Stk.	July 29	4½	Newc't e & G'tesh'd Con	106–108	..	4 3 4
518,795	Stk.	Dec 29	3½	Do. 3½ p.c. Deb.	9.–95*	..	3 15 3
55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13–13¾	..	5 3 8
300,000	Stk.	Nov. 26	8	Oriental, Ltd.	137–139	..	5 15 1
60,000	5	Sep. 10	8	Ottoman, Ltd.	6⅞–6⅞	..	6 5 6
31,830	53	Aug. 26	13	Portsea Island A.	137–139	..	4 19 0
60,000	50	,,	13	Do, B.	129–131	..	4 19 3
100,000	50	,,	12	Do, C.	122–124	..	4 16 9
114,800	50	,,	10	Do, D and E.	102–104	+1	4 16 2
398,490	5	Oct. 28	7	Primitiva Ord.	7⅞–7⅞	..	4 14 11
796,980	5	July 29	5	Do. 5 p.c Pref.	5⅛–5⅛	..	4 13 0
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	97–99	..	4 0 10
1,000,000	10	Oct 14	8	River Plate Ord.	17–17⅛	..	4 11 5
312,650	Stk.	Dec. 29	4	Do. 4 p.c. Deb.	98–100*	..	4 0 0
250,000	10	Sep. 29	8	San Paulo, Ltd.	14½–15	..	5 6 8
62,500	10	,,	6	Do 6 p.c. Pref.	11½–12½	..	4 18 0
125,000	50	Jan. 3	5	Do 5 p.c. Deb.	50–51*	..	4 18 0
135,000	Stk.	Sep. 0	10	Sheffield A	233–235	..	4 5 1
269,98.	,,	,,	10	Do. B	233–235	..	4 5 1
523,5.0	,,	'	10	Do. C	233–235	..	4 5 1
70,000	10	Oct. 14	10	South African	12½–12¾	..	7 16 11
6,429,895	Stk.	Aug. 12	5⅓	So th Met., 4 p.c. Ord.	120–122	..	4 7 4
1,895,445	,,	July 1.	3	Do. 3 p.c. Deb.	82–84	..	3 11 5
209,82.	Stk	Aug. 26	8	South Shields Co., Stk.	160–162	..	4 18 9
605,003	Stk.	Aug. 12	5⅓	S'th Suburb'n Ord. 5 p.c.	120–122	..	4 10 2
60,000	,,	,,	5	Do. 5 p.c. Pref.	120–122	..	4 2 0
117,0.8	,,	July 14	5	Do. 5 p.c. Deb. Stk.	122–124	..	4 0 8
502,310	Stk.	Nov. 11	5	Southampton Ord.	110–112	+1	4 9 3
120,0.0	Stk.	Aug. 12	6⅞	Tottenham A 5 p.c.	133–135	..	5 1 9
453,940	,,	,,	5⅝	and B 3½ p.c.	111–113	..	4 15 3
149,470	,,	Dec. 29	4	Edmonton 4 p.c. Deb.	98–100*	..	4 0 0
182,380	10	Dec. 29	8	Tuscan, Ltd.	9–9⅛*	..	8 8 6
149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	99–101*	..	4 19 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	110–112	..	4 9 3
255,6.6	Stk.	Aug. 26	6⅝	Wands- B 3½ p.c.	139–141	..	4 14 0
79,416	,,	Dec. 29	3	worth 3 p.c. Deb. Stk.	72–74*	..	4 1 1

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"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

SPENCER'S PATENT HURDLE GRIDS.
THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Dec. 7, p. 705.

WANTED, Regular Supplies of Sul- PHUR from the Claus Process.
Apply to HENRY ELLISON, LIMITED, Cleckheaton, YORKS.

APPLICATIONS FOR APPOINTMENTS.
DO you appreciate how much success depends on well-considered and lucid presentment of your qualifications? I make a Specialty of the Preparation of Applications, and am continually receiving complimentary letters from clients. Write now for Particulars.
HERBERT GREATOREX, HACKNEY, MATLOCK.

WANTED—A Foreman for Tar-Works.
Apply, by letter, stating Experience and Wages required, to No. 5169, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CAST-IRON Pipes. Spigot and Socket or Flanged. Special Quality—9 feet or 12 feet Lengths. When buying, Write us.
A. LOWCOCK, Limited, SHREWSBURY.

GASHOLDERS—Splendid, 45 feet dia- meter, and New STEEL TANK fixed complete, to Plan and Specification. Also 50 feet Single-Lift and 50 feet Double-Lift. Cheap, with STEEL TANKS Can be seen temporarily erected.
FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

FOR SALE.
THE Mansfield Corporation have for SALE a Laycock and Clapham's "Eclipse," WASHER-SCRUBBER. Capacity, 500,000 Cubic Feet per Day. In good working order. May be seen at Work. Reason for disposal, putting in larger Plant.
For further Particulars, Apply to ARTHUR GRAHAM, Gas and Water Engineer, Gas-Works, Mansfield.

BECCLES WATER AND GAS COMPANY.

GAS ENGINEER AND MANAGER.

THE Directors of this Company invite APPLICATIONS for the post of GAS ENGINEER and MANAGER.

Candidates must possess a competent knowledge of Gas Engineering, and must be Conversant with the Manufacture and Distribution of Gas and of Sulphate of Ammonia and other Products.

The Person appointed will be required to devote the Whole of his Time to the Duties of his Office.

The Salary will be at the rate of £130 a Year.

The make of Gas for the past year was 22,603,700 Cubic Feet.

Applications, in Writing, Stating the Candidate's Age and Experience, and accompanied by recent Testimonials, are to be sent to the Secretary of the Company not later than the 1st of February, 1910.

By order,
F. S. RIX,
Secretary.

Beccles, Suffolk,
Jan. 5, 1910.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

BOROUGH OF HEYWOOD.

THE Gas Committee of the Corporation of Heywood are prepared to receive TENDERS for the Supply of RETORTS and FIRE-CLAY GOODS.

Specification and Quantities and Form of Tender may be obtained upon Application to Mr. W. Whatmough, Gas Manager.

Sealed Tenders, endorsed "Retorts and Fire-Clay Goods," to be sent to me not later than Tuesday, Jan. 18, 1910.

By order,
GEO. G. BOUCHIER,
Town Clerk.

Municipal Buildings,
Heywood, Jan. 1, 1910.

MUNICIPALITY OF PRETORIA, TRANSVAAL.

COAL TAR FOR ROAD-MAKING PURPOSES.

TENDERS are invited for the Supply and Delivery of approximately 35,000 Gallons of Gas-Work COAL TAR suitable for Road-Making purposes; delivery free at Pretoria, Transvaal. No Water-Gas Tar, Coke-Oven Tar, or Blast-Furnace Tar will be accepted.

Conditions and Specification may be obtained from the Agents for the Municipality, Messrs. Mosenthal, Sons, and Co., 72, Basinghall Street, London, E.C , on and after Wednesday, the 12th of January.

Tenders must be sent in to the undersigned on or before Thursday, the 20th of January.

The Municipality do not bind themselves to accept the lowest or any Tender.

MOSENTHAL, SONS, AND CO.,
London Agents.

72, Basinghall Street, London, E.C.

BOROUGH OF EAST RETFORD.

GAS UNDERTAKING.

THE Gas Committee of the above Corporation are open to receive TENDERS for the DISMANTLING and REMOVAL of an old BENCH of SIX SETTINGS of RETORTS, on the Direct-Fired System, and the REBUILDING of a Complete New Stack of Six Settings of Seven RETORTS, each with SHALLOW TUBULAR REGENERATIVE TYPE of FURNACES.

The Contract to include the Supply and Erection of all the necessary Steel and Ironwork for same, including Retort Mouthpieces, Ascension Pipes, Hydraulic Mains, Girders, Buckstaves, Valves, Furnace Fittings, Sight Boxes, Girders and Cover Plates for Subway.

The Specification may be seen, and further Particulars obtained, on personal Application to the undersigned.

Tenders to be sent in not later than Feb. 3, 1910, addressed to the Chairman of the Gas Committee, endorsed "Tender for Retort Settings."

The lowest or any Tender will not necessarily be accepted.

J. B. FENWICK,
Engineer and Manager.

Gas and Water Offices, Grove Street,
Retford, Jan. 5, 1910.

GUILDFORD GASLIGHT AND COKE COMPANY.

FIRE-BRICK ARCHES, MAIN FLUE, AND CHIMNEY.

THE Directors of the above Company invite TENDERS for the Supply of all Material for and the Erection of Nine Arches, one Main Flue, and one Chimney at their Gas-Works, Onslow Street, Guildford.

Specification, Blue Print, and further Particulars can be obtained, on deposit of One Guinea (which will be returned upon receipt of a *bonâ-fide* Tender), from Mr. P. C. Cleasby, Gas-Works, Guildford.

Tenders, sealed and endorsed "Tender for Arches," addressed to the Chairman of this Company, to be delivered at these offices not later than noon on Friday, the 28th day of January, 1910.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
WM. TITLEY,
Secretary.

Gas Offices, Onslow Street,
Guildford, Jan. 7, 1910.

BURSLEM CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply and Erection Complete at their Longport Gas-Works:—

Contract No. 11. OXIDE ELEVATOR for FOUR PURIFIERS.

Contract No 12. LANCASHIRE BOILER, 8 feet diameter.

Plans, Specification, and General Condition may be inspected at the Gas Office, Longport, and Forms of Tender obtained from the undersigned on payment of One Guinea, to be returned on receipt of a *bonâ-fide* Tender.

The Committee do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Oxide Elevator" or "Steam Boiler," as the case may be, to be sent to Arthur Ellis, Esq., Town Clerk, Burslem, not later than Ten a.m., Jan. 20, 1910.

EDWARD JONES,
Engineer and General Manager.

Gas Offices, Burslem,
Jan. 8, 1910.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

THE Proprietor of the Patent No. 2245, of 1906, relating to "AN IMPROVED METHOD OF, AND APPARATUS FOR GASIFYING RAW COMBUSTIBLE MATERIALS," is desirous of entering into Arrangements, by way of LICENSE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its full Development and Practical Working in this Country.

All Communications should be addressed in the first instance to S. F. PAUL AND CO., 60, DOUGHTY STREET, W.C.

PATENT RIGHTS FOR SALE.

The Hasty Safety Gas Valve
AND THE
Hasty Automatic Meter Valve
caused a sensation at the New York Gas Show.

In order to increase the size of our American Factory, we offer FOR SALE the Patent Rights on these Two Contrivances in Great Britain, United Kingdom, Australia, Australian Commonwealth, Belgium, France, and Germany.

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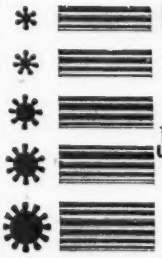
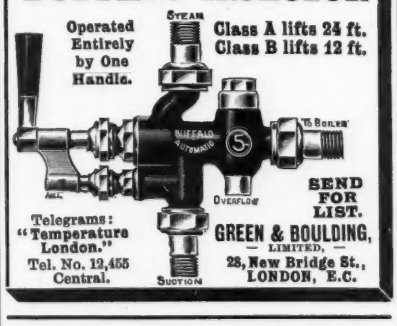


BRASS AND STEEL PINION WIRE
any lengths.

John Rigby & Sons, Ld.
Rawfolds Wire Mills,
CLECKHEATON.
Head Office & Works:
Adelphi Wire Mills,
Salford, MANCHESTER.
Also IRON and STEEL WIRE of all descriptions.

'BUFFALO' INJECTOR



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LIMITED,
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Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.
RETORTS CAREFULLY PACKED FOR SHIPMENT.

PYROPHORIC GAS LIGHTERS.

Genuine Novelty. Selling Splendidly.
"Presto," 7½", as illustrated, retails complete, 1/9;
"Pyros," for Shop Windows, 30" long, complete, 4/6.
Refills (5000 sparks) 9d. and 1/- each retail.
PAUL METZ (G. L. Dept.), 29, Newhall Hill, Birmingham.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

JOHN COATES & CO., LTD.,
Gas and Water Works Engineers, Inspectors, and Merchant Shippers,
5, Laurence Pountney Hill, LONDON, E.C.

NOTE. Much expense and trouble is often saved by Colonial and Foreign Gas and Water Companies, and City Corporations, by having their requirements from Great Britain bought or properly inspected by practical men. We have a staff of experts for Buying, Shipping, and Inspection, of Gas Plant and Machinery of every description, Cast Iron Pipes, &c., and may add that our Engineering Branch is under the direction of Mr. John Coates, M.Inst.C.E., and Shipping Branch under Mr. Alfred J. Kingdon, both with over 20 years' experience.
J. C. & Co.

MIDLAND ENAMELLING CO.,
Manufacturers of
DIALS (Enamelled)
For Gas, Water, Electric, &c., Meters.
DIALS
For Pressure Scales in One Length up to 4 feet.
DIALS
For Clocks, Barometers, Thermometer Indicators, and for every purpose.
140, Finch Rd., Handsworth, Birmingham.

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ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works (also large Stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

LUX'S
Gas Purifying Material
is now used in many Gas-Works throughout Scotland with gratifying success.

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Ludwigshafen-am-Rhein
Sole Agent for Scotland:
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Telegrams: "GASLUX, EDINBURGH"
Descriptive Pamphlet on Application.

Testing Instruments

ALEXANDER WRIGHT & CO., LD.
WESTMINSTER.

HEATHCOTE GAS COAL
from the
GRASSMOOR COLLIERIES,
CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

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Price, Bound in Cloth, 5s. 6d., Post Free.
TWENTY-SEVENTH YEAR
THE
Complete Reports
OF
PROCEEDINGS
OF THE
DISTRICT ASSOCIATIONS
OF
GAS MANAGERS
FOR 1909.
Most of the previous Volumes are still on Sale.
LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
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AND ENGINEERS' TOOLS GENERALLY.
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THE SILICA FIRE-BRICK COMPANY,
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RADIATE MORE HEAT
BY USING
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SILCO BRICKS prevent all settling of setting.
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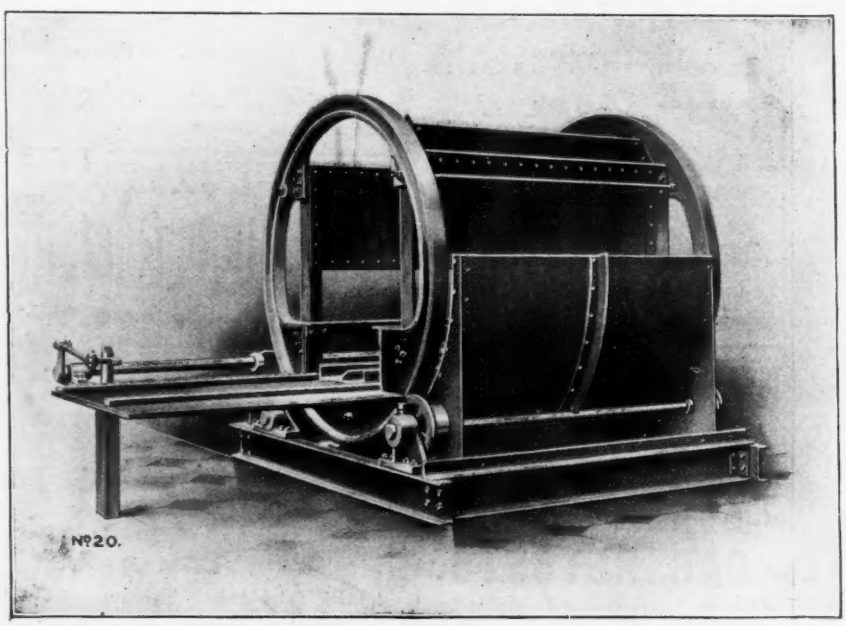


SOLE MAKERS OF
THE MANSFIELD PATENT
AUTOMATIC TIPPLER,
Capable of dealing with 400 TUBS per Hour.

CRUSHING MACHINERY
FOR
All kinds of Material a Speciality.

Steel Structural Work.
ROOFS and BUNKERS.

ALLEN'S IMPERIAL AUTOMATIC
DUST-PROOF MEASURERS

STEEL CASTINGS, TOOL STEEL, &c.

IMPERIAL STEEL WORKS, SHEFFIELD.

GRAETZIN LIGHT

Important Improvements.

BURNERS.

1. **20-Candle Power more light** without increase in the consumption of gas.
2. **Patent Gas Adjuster;** cannot get out of order.
3. **Automatic Gas Regulator,** ensures a constant and unvarying pressure of 35 mm., guarantees a steady light, at the same time obviating waste of gas and blackening of the burner.
4. **Accurate Regulation of the Air Supply.**
5. Burners will be supplied either with Gas Adjuster or Automatic Gas Regulator.
6. The brass casing is heatproof, and, if occasionally cleaned with warm water, will not become discoloured.

LAMPS.

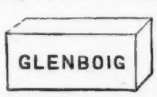
From Lamps with more than one burner, the injectors can be removed from the outside, without taking the lamps to pieces.

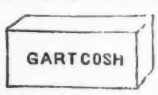
THE GLENBOIG UNION FIRE-CLAY CO., LTD.

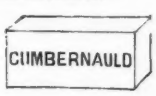
GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

TRADE MARKS.







The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.
The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS, BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

Works: GLENBOIG, LANARKSHIRE.
Offices: 48, West Regent St., Glasgow.

56 Prize Medals and Diplomas of Honour.
Highest Award wherever exhibited.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, Leadenhall Street,
London, E.C., September 21st, 1909.

Dear Sirs,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3·03	3·49
Silica, combined	43·20	49·77
Alumina	36·55	42·10
Ferric oxide	1·80	2·08
Titanic oxide	1·30	1·50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0·22	1·06
Loss on Ignition	13·20	—
	100·00	100·00

PHYSICAL RESULTS.

Density	2·65
Volume weight	1·90
Porosity	15·4 %
Linear shrinkage at 100° C.	3·70 %
" " " 1050° C.	4·76 %
" " Total	8·46 %
Volume shrinkage at 100° C.	10·7 %
" " " 1050° C.	12·6 %
" " Total	23·3 %
Plasticity	20·0 %
Fire Stability	1850° C. equiv. to 3362° F.

(SEGER CONE 36.) (New Scale CONE 38.)

(Signed) J. T. NORMAN.

This Clay is remarkable for its high percentage of Alumina and for the almost complete absence of ingredients tending to lower the refractory properties; its fire stability is extremely high. For some years past I have been urging clients who are working the Clays of the Coal Measures to search for such a material, but you are the first to discover a supply. The possession of this Clay places you in a unique position amongst the manufacturers of refractory goods throughout the world, and I have no doubt will, if duly exploited, enable you to drive out of the market the large quantities of foreign fire-bricks which are being poured into this country for use in the construction of bye-product ovens and for other purposes.—I am, yours faithfully,

JOHN T. NORMAN.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: E. C. BROWN & Co.,
LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

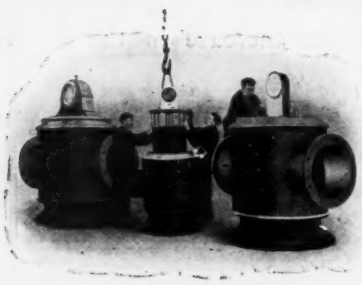
MIRFIELD GAS COAL.

UNEQUALLED.

Sperm Value 878·85 lbs. per Ton.

Please apply for Price, Analysis, and Report, to the

MIRFIELD COLLIERY COMPANY,
RAVENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.



OVER 600
ROTARY
Station Meters
IN COMMISSION.

Particulars from—
T. G. MARSH,
28, Deansgate,
MANCHESTER.

8vo., in Stiff Paper Cover. Price 1s.

THE
EARLIEST WORKS ON GAS LIGHTING.

A List of Books, Pamphlets, and Important References prior to the Year 1840.

By F. SOUTHWELL CRIPPS, Assoc.M Inst.C.E.

LONDON: WALTER KING, 11, BOLT COURT, FLEET ST., E.C

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ENGINEERS,
HASLINGDEN, nr. MANCHESTER.

LIME & OXIDE ELEVATORS & CONVEYORS
COAL AND COKE STORAGE PLANTS.
Coal and Coke Elevators and Conveyors.
STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.
DETACHABLE CHAINS AND SPROCKET WHEELS.
HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.

RETORTS
Of our Manufacture
STOP WASTE AND LEAKAGE

They are guaranteed not to contract and do not readily split and fracture but retain apparent wholeness after a long period of work.

Top Quality FIRE-BRICKS, QUARRIES, &c.

High Grade Silica Bricks and Blocks for Combustion Chambers and Special Work.

WILLIAMSON, CLIFF, LTD., STAMFORD.

Gasholders and Steel Tanks.

Purifiers.

Condensers.

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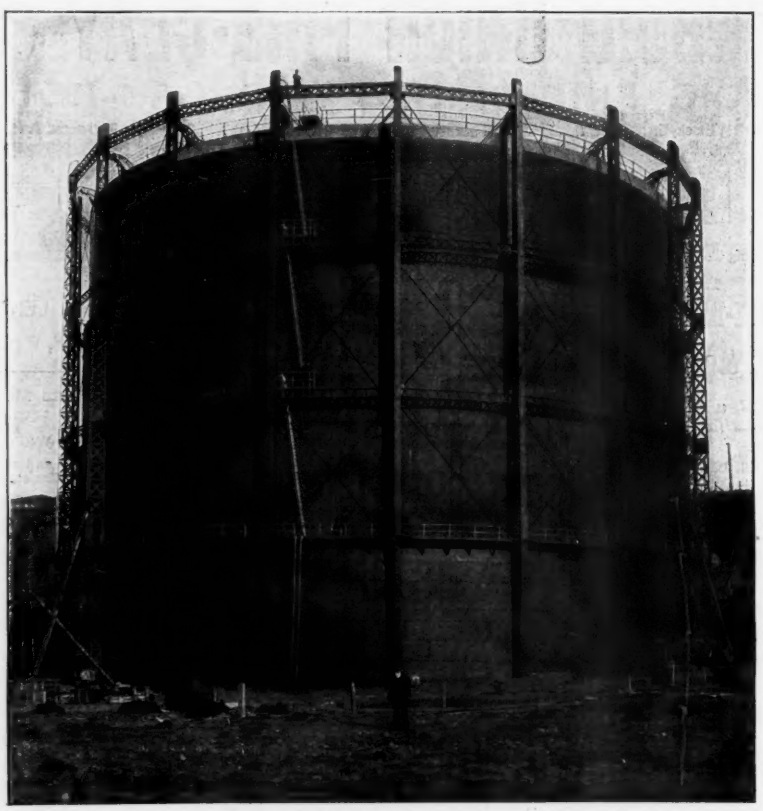
Structural Steel Work.

Steel Storage Tanks for Oil, Water, &c.

Welded and Riveted Steel Mains.



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ORIGINAL MAKERS.

Three-Lift Telescopic Gasholder and Steel Tank, Made and Erected by

CLAYTON, SON & CO., LTD., LEEDS,

For the WELLINGTON GAS CO., Miramar Works, New Zealand. Tank, 152 ft. 6 in. dia. Gasholder, 150 ft. dia. by 30 ft. Lifts.

Welsbach LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

BRITISH MADE.

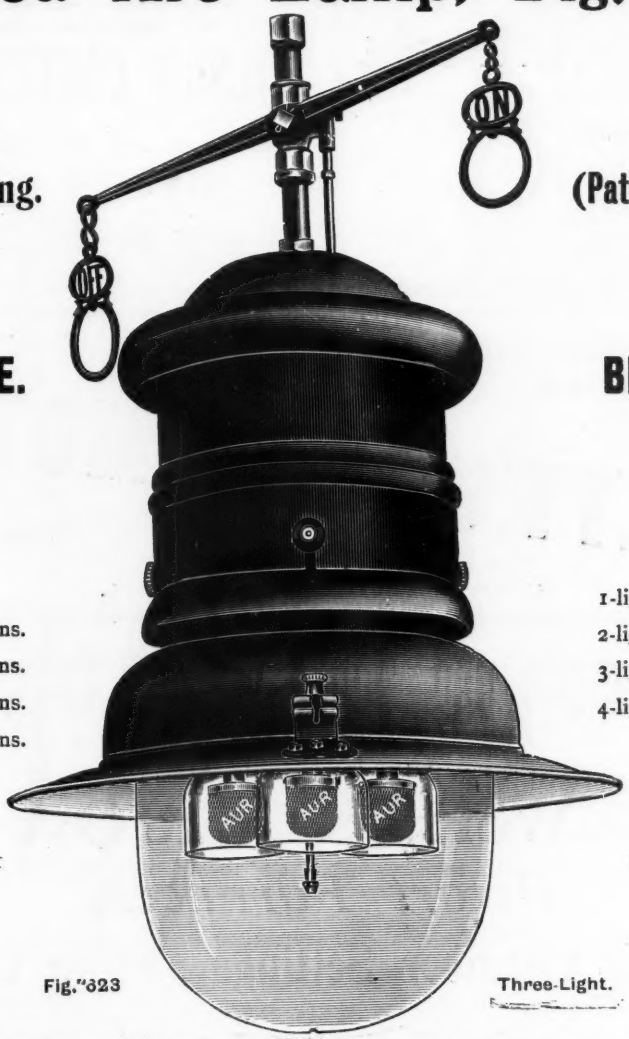

Fig. 623 Three-Light.

Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	*C.P.*	*Steel.*	*Copper Case.*		*Gas per hour.*	*C.P.*	*Steel.*	*Copper Case.*
1-light	4 feet	125	**30/-**	**5/-** extra.	3-light	12 feet	400	**52/6**	**6/-** extra.
2-light	8 feet	260	**47/6**	**6/-** extra.	4-light	16 feet	550	**72/6**	**9/-** extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Clear Glass Globes, each	**2/3**	**5/9**	**5/9**	**9/-**
" " " In Case lots per dozen.	**19/6**	**57/9**	**57/9**	**93/-**
Case contains . .	*80*	*18*	*18*	*12*

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Wired Globes, extra each	**2/-**	**2/-**	**2/9**	**3/6**
Parabolic Reflector, extra "	**3/6**	**6/-**	**7/6**	Not made

Welsbach Mantles, each **6d.** subject as usual.

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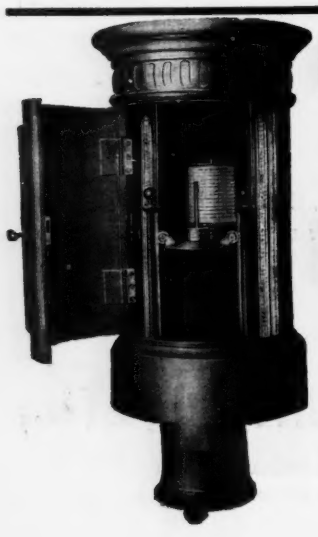

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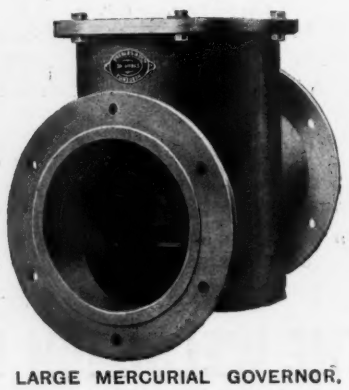

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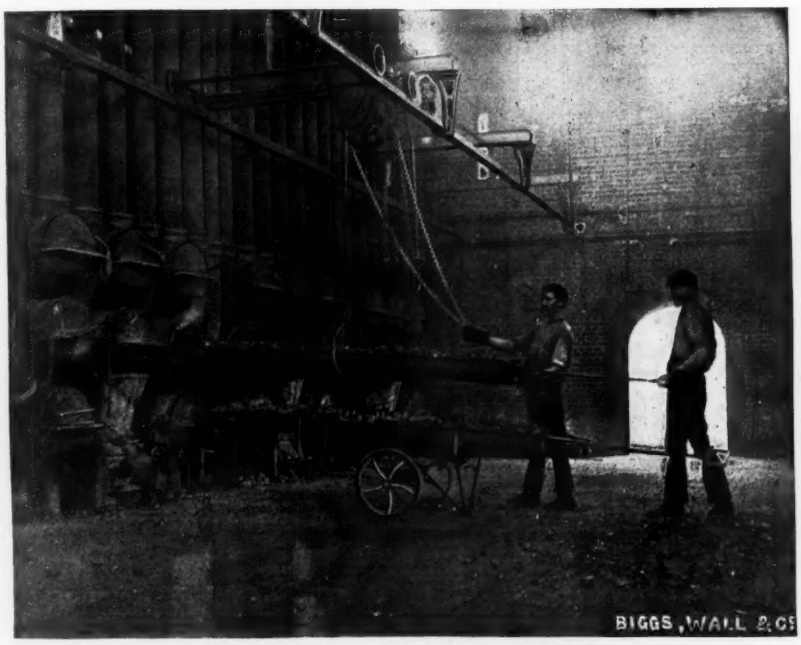

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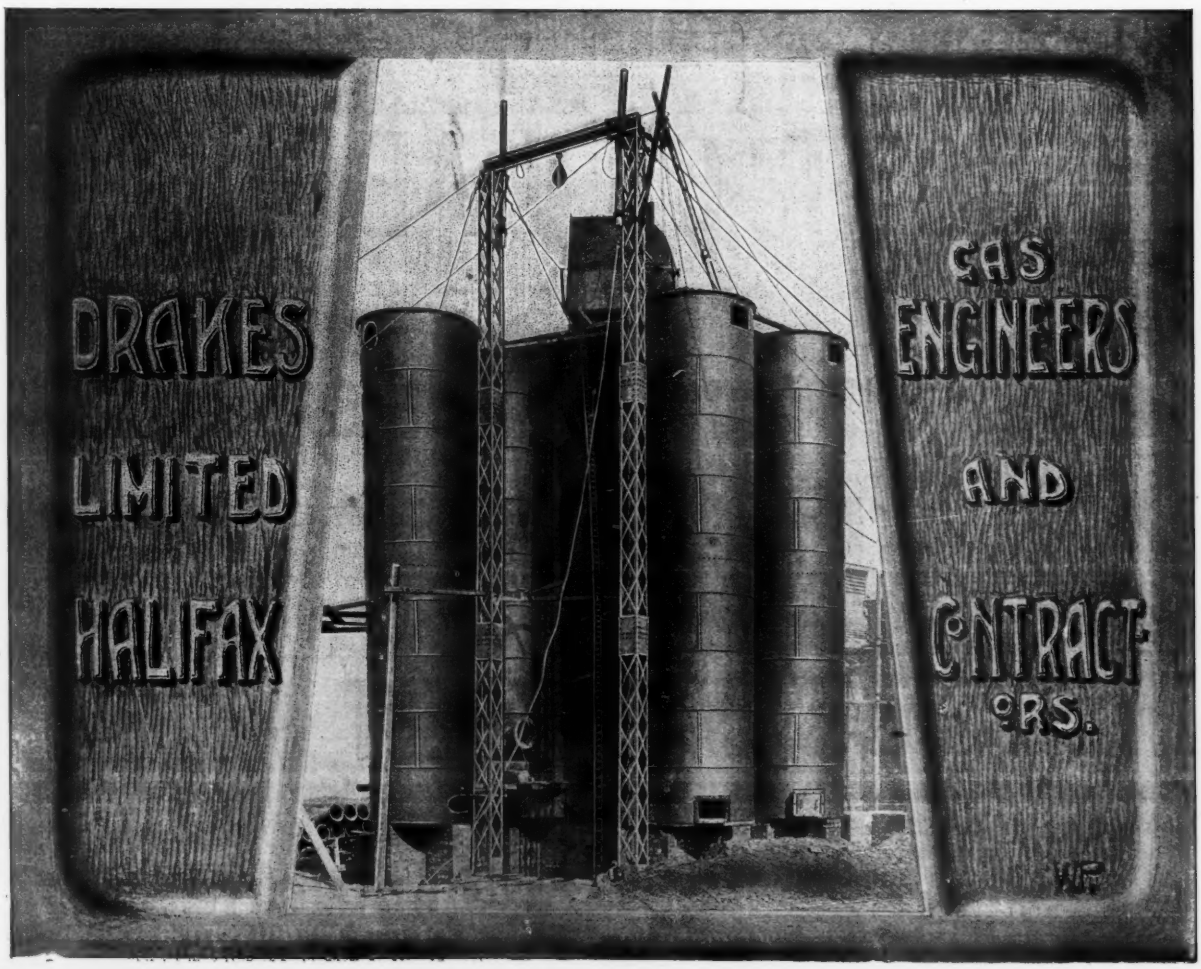

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